Isaac Newton and the perils of the financial South Sea

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Preliminary version, January 7, 2020

Abstract. In spite of Isaac Newton’s general brilliance and expertise in finance, groupthink led him to plunge into the South Sea Bubble and lose much of his fortune.

1 Introduction

Brilliant scientists have been known to do foolish things. Yet Isaac Newton’s financially disastrous moves in the South Sea Bubble of 1720 deserve special attention. He was among the contrarian minority of investors who decided correctly in the early stages of that mania that it was going to end badly, and liquidated his stake at a large profit. But the bubble kept inflating, and he yielded to the prevailing groupthink and jumped back in, almost at the very top. His experience provides an instructive example of how even brilliant thinkers can go astray in an environment that lends itself to collective hallucinations as a result of the proliferation of misinformation and disinformation.

The story of Newton’s losses in the South Sea Bubble and how he supposedly said that he could “calculate the motions of the heavenly bodies, but not the madness of people,” is one of the most famous in the popular finance literature. For a long time, it was supported by just a few items of reliable information. Recently, much additional information was discovered which provides considerably more detail about Newton’s financial travails [12]. This article is based largely on that paper, plus two additional pieces of concrete information. We still lack a complete accounting of Newton’s investments, but the overall outline of what he did and how much he lost is reasonably full and convincing. Unlike many other anecdotes about famous figures, the basic story of Newton and the South Sea Bubble as it was retold innumerable times was largely correct. In some ways it even understates the extent of his mistakes.

2 South Sea Bubble basics

The South Sea Bubble has a voluminous literature devoted to it, and is cited frequently. But one has to be careful, since many accounts and references are faulty. For example, it is often claimed inaccurately that the South Sea Company was a fraudulent enterprise from the start, or that it collapsed after the crash of the Bubble in the fall of 1720. A short reliable overview is available in a chapter in Chancellor’s book [5]. The main book-length recent treatment is in Carswell’s book [4], and detailed financial and other data are
presented in the older works of Anderson and Scott \cite{Anderson1966} and in the more recent one of Dale \cite{Dale1980}. There is also a brief survey in \cite{Kroll1977}, and a more extensive work that explores the post-truth world of 1720 that led British investors astray is in preparation \cite{Kroll1978}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{south_sea_prices_in_1720.png}
\caption{South Sea stock prices and investments by Newton during the Bubble of 1720. Prices adjusted for stock dividends. The ranges for purchases and sales are largely inferred and approximate, while vertical lines denote documented dates of either actual transactions or instructions for transactions. The “Newton buys for Hall” label represents some of the purchases of South Sea securities by an estate for which Newton was an executor. The “South Sea Bill” shows the 7 April date that the main legislation authorizing the South Sea scheme was passed, and “South Sea Co. meeting” shows the 21 April meeting of South Sea investors. The gap in prices at the end of June was a real phenomenon, caused by a change from transactions for immediate cash settlement to what are today called “futures.”}
\end{figure}

The South Sea Company was established in 1711 as a financial vehicle for converting short-term British government debt into long-term obligations. The name was derived from this enterprise’s monopoly on British trade with the West coast of the Americas and part of the East coast of South America. This privilege was given to it as a sweetener, to make the debt conversion more attractive. During the late 1710s the South Sea Company was a very respectable operation, with the largest capitalization of any joint stock enterprise in the world. It was also a rather dull operation, basically just passing on the government’s payments to its investors. We don’t have enough information to tell whether its trading
activities during this period were profitable. However, in any case they were of minor financial importance to the company, although they did help inspire dreams of future riches among the public. Newton was an early investor and generally kept adding to his stake in this company as time went on. He owned some government bonds directly, and, in the joint stock area, he had investments in the Bank of England and the South Sea Company, and the latter did somewhat better. But both of those investments were very profitable, as interest rates were dropping after the long period of draining wars, and peacetime economic activities were growing.

The economic recovery of the late 1710s, together with John Law’s Mississippi Scheme in Paris, inspired a project for the South Sea Company to take over most of the British national debt in 1720. The result was the South Sea Bubble, visible in Fig. 1 in the price of South Sea Stock. Various observers, then and later, regarded this operation primarily as a government swindle of holders of that debt. We won’t consider that aspect here, as the focus is on investment decisions of Newton and other individual investors. The Bubble lasted basically just half a year, with a precipitous collapse in September 1720. At the end, the South Sea Company was in control of about 70% of all tradeable securities in Britain, consisting of an even higher fraction of what was then regarded as a huge British national debt (which was at a level of around 75% of the country’s GDP). After some financial restructuring, the South Sea Company continued to exist until the middle of the 19th century, almost exclusively as a private agent handling the paying out of government funds to holders of a declining part of the national debt. Those who bought South Sea Stock before the Bubble, say by mid-1719, and simply held onto it for a few years, did very well, as they were rewarded with a roughly 50% capital gain on top of generous dividends. This was due to a large “Ponzi scheme” element in the financial moves of that company during 1720, in which the early investors gained at the expense of those lured in during the Bubble.

3 Newton’s finances

In 1720, Newton was almost 80. His significant scientific achievements were decades in the past, and he was not doing any original research. Still, he was very active. He continued to lead the Royal Society as its President and was a celebrity that foreign dignitaries visiting London were eager to meet. He was called upon for technical advice in various areas (such as that of finding longitude at sea) by both the government and private individuals. His physical and mental decline apparently started a few years later, as is detailed in the most authoritative biography available today, that of Westfall [17].

Comparing economic circumstances across three centuries cannot be precise. But the population of Britain was around 7 million in 1720, with metropolitan London accounting for about 700 thousand. GDP was on the order of £70 million, so GDP per capita was about £10, while the national debt was about £50 million. To translate the prices and wages of 1720 into modern terms, it is therefore not unreasonable to multiply them by a factor of 1,000. Given the imprecision of any such comparison, the same factor of 1,000 applies whether one is translating into modern pounds sterling, US dollars, or Euros.
Newton left his academic position at Cambridge for a post at the Royal Mint in 1696, where he played an important role in carrying out the great recoinage of the 1690s. From that point on, he was one of the group of professional non-partisan senior civil servants who displaced some of the rapacious political appointees who used to dominate. The new cadre did much to improve the efficiency of the government and thus enabled Britain’s rise to its great power and eminence.

From 1699 to the end of his life in 1727 Newton was Master of the Mint. This was a very lucrative post. Whereas his academic position paid about £100 per year, his earnings at the Mint (consisting of a salary and, much more important though more variable, a fraction of the turnover) averaged close to £2,000 per year. By 1720 he was also earning well over £1,000 per year from dividends on his investments. This total annual income of over £3,000, comparable to $3 million today, put him safely in the top 1% of the population, and not far from the top 0.1%. He was recognized as a member of the British elite, and he lived well, with a horse-drawn coach and a retinue of servants that were marks of the affluent strata. But he did not overspend, was charitable, and saved a substantial fraction of his earnings.

Newton’s net worth shortly before the South Sea Bubble was somewhat over £30,000, so can be thought of as comparable to £30 million, or $30 million. That is also the approximate value of his estate at his death in 1727, so the claims he was ruined by the Bubble are incorrect. However, he did lose a substantial amount in absolute terms, and far more in terms of what he might have had had he been a bit more astute. By mid-1721, his net worth was down to about £20,000. This represents a loss of about £10,000. A famous anecdote claims he lost twice that much. That is plausible, since there are various ways to count one’s investment losses, and one could easily come up with even higher figures for Newton. For example, as will be described below, he made a profit of about £20,000 in the early stages of the Bubble, and had he simply managed to hang onto that by abstaining from any further investments in the South Sea Company, he would have emerged from that event worth over £50,000. Instead, he put practically all his money into that doomed venture.

4 Newton and the South Sea Bubble

Although it was trade, finance, and industry that propelled Britain’s rise, land ownership continued to be dominant in perceptions of political power and social prestige till the end of the 19th century. Yet Newton never acquired any significant real estate. He was among the pioneers who put their money primarily into the marketable instruments that the Financial Revolution of that period created. Those were primarily government bonds and securities of the large joint stock companies such as the Bank of England and the South Sea Company. Much of the population regarded them with suspicion, as the new-fangled instruments of corruption and upheaval of traditional life.

Our knowledge of Newton’s finances appears to be fairly complete for the period after the crash of the South Sea Bubble. At the end of 1720, essentially all his wealth was in South Sea securities. Over the next few years, he diversified by shifting about half of that into Bank of England Stock, and put in additional funds coming from his savings into
Bank securities. (In retrospect, this was not the best move, as South Sea securities did slightly better, but the difference was minor, and presumably he got greater peace of mind by spreading his money around.)

Deducing what Newton did during 1720 involves substantial inferences from the incomplete data we possess. Fig. 1 summarizes the main moves we have evidence for. At the start of that “fatal year,” as it was almost universally called for some time after the crash, slightly less than half of Newton’s assets were in South Sea Stock (which can be thought of as shares), and the rest in government bonds. At that time, as can be seen in Fig. 1, South Sea Stock was around 130, and most of Newton’s stake had been acquired much earlier, at prices around 100 or below.

The two vertical lines marked “Newton sells” represent two instructions he issued in April 1720 for sales of his South Sea Stock, and are discussed in more detail later. The horizontal line marked “Newton sells” represents a period during which Newton was acquiring a large holding of British government bonds, surely from the liquidation of his South Sea Stock pursuant to those instructions. The first of the four vertical lines marked “Newton buys” represents his liquidation of almost all of that newly acquired stake in government bonds, and the proceeds of that sale are assumed to have been spent purchasing South Sea Stock. The other three vertical lines marked “Newton buys” denote concrete cases where Newton either bought South Sea Stock directly, or converted some of his other government bonds into it. Thus he continued to pour money into the South Sea Stock even as its price was beginning to slide, before the precipitous collapse in September 1720. By that time, essentially his entire fortune was in that security, and he continued with it until the diversification into Bank of England Stock mentioned above, which started in 1724.

Unfortunately we have no direct evidence of what motivated Newton’s financial decisions. However, some additional insights can be obtained from the records of an estate. Thomas Hall was another senior and wealthy civil servant and named his friend Newton as one of the trustees of his estate. Unlike for Newton himself, we have a complete record of the financial transactions of that estate, since the trustees had to be able to account for their actions to the beneficiaries and the judicial system. The estate took three years to settle, and covered all of 1720. The account book was preserved among Newton’s papers and has only been studied recently [12].

The investment decisions of the Hall estate were not made just by Newton, as they also involved the other three trustees, and Francis Hall, the principal beneficiary. Still, Newton must at least have consented to those decisions. His own thinking surely was also influenced by the discussions in that group. Fig. 1 shows the first and two final moves by the estate into South Sea Stock. Those last two occurred as the Stock was more than halfway down its slide, and show real faith in the South Sea project. The first took place just as Newton’s purchases of government bonds were ending, and it may be that his sales of South Sea Stock had just concluded. The Hall estate account book does mention that this first move was at the request of Francis Hall. There must have been serious debates about this shift of funds, and they were surely heavily influenced by the rapidly rising price, visible in Fig. 1. Newton took several weeks to decide to follow that example, and by that time prices were
much higher, and close to their peak. His later investments were also made at very high prices, and so were that much more damaging.

5 Newton’s early skepticism and later conversion

Let us now consider in more detail the investment scene in April 1720, when Newton took his profits on his South Sea stake. The project for the South Sea Company to take over almost all of the British national debt was presented to Parliament at the end of January 1720, and after heated debate, was selected over a competing Bank of England proposal at the beginning of February. This led to a noticeable but not giant rise in South Sea Stock price, as is visible in Fig. 1. There was a far larger rise at the end of March, when the final details were being hammered out in the legislation to authorize the scheme, and the South Sea Company won some seemingly small technical points. When the official Act became law on 7 April, there was actually a slight decline, but overall, South Sea Stock price did not vary much until the end of May, when it started its vertiginous climb. So what could have induced Newton to sell out in the middle of this period, between the beginning of April and end of May, at a price he could have obtained right at the start?

The analysis of [12] was based on many fragmentary pieces of information about Newton’s holdings of various securities, and concluded that he very likely had at least 10,000 units of South Sea Stock (which can be thought of, and is often presented in the literature, as 100 shares, but that is not completely correct), and that he sold all of that starting in late April. But that analysis involved just one item explicitly about Newton’s South Sea Stock, namely his instruction dated 19 April for sale of 3,000 units of that Stock. What had been overlooked in the preparation of that paper was another item that had been published almost a century ago, Newton’s instruction dated 23 April for sale of 7,000 units ([15], p. 103). This additional item fits in very well with the other pieces of hard data and the deductions in [12], and strongly suggests that Newton decided to liquidate his entire, or almost entire, stake in the South Sea venture in the space of less than one week, on Tuesday and Saturday, 19 and 23 April. Those two days neatly bracket a meeting of South Sea investors on 21 April. We do not know much about what transpired at that meeting, but according to news reports it was attended by many, and had long discussions and presentations. It could be that those helped strengthen Newton’s skepticism or caution shown in the partial sale instructions of two days earlier, and led him to decide to get out with the rest of his paper gains. It is intriguing that Thomas Guy, the person who has long been known to history as making giant gains in the South Sea Bubble (and endowing the Thomas Guy Hospital, which has made great contributions to medicine in the last three centuries based on those gains) started liquidating his stake the day after the stockholder meeting, on 22 April [12].

Newton must also have participated in various discussions (which, in the “respectable” London society of that time, were often carried on in coffee-houses), and he must have read the press (which was also read to a large extent in coffee-houses). April 1720 saw the publication of an unusually large number of pieces about the economic fundamentals of the South Sea project. A week after the passing of the South Sea Act, on 14 April, the South Sea Company sold some of its stock to the public in the first of four “money
subscriptions.” Surely in order to stir up enthusiasm for this venture, the managers of that company apparently arranged for the publication of a “puff” piece in the newspaper *Flying Post* of 9 April. It was published anonymously, but marked as coming from a “friend” of the company. It attracted much attention, as it presented a wonderful prospect, in which the higher the price at which South Sea Stock was sold, the better it would be for investors. This piece reached its astounding conclusion by a certain amount of what today might be called “mathiness,” hiding the essence of the argument, which was basically that of a Ponzi scheme, behind some complexification.

This same piece was reprinted a week later in both the *Flying Post* and in Mist’s *Weekly Journal*. But on the day of those reprints, 16 April, there appeared the first of the three printed refutations that have survived. The second rebuttal, by Archibald Hutcheson, the most famous of the debunkers of the South Sea project, appeared on 21 April, the date of the South Sea Company stockholder meeting. It is possible that Newton was influenced by those refutations, or he may have reached their conclusion themselves, as it was not difficult to figure out the fallacy of the puff piece. He may have decided that any venture that concocted such preposterous arguments should be avoided. Unfortunately it is unlikely we will ever learn what motivated Newton. But whatever it was, it did not act on the bulk of British investors, as the price of South Sea Stock did not change much until it started climbing towards the end of May.

How could people disregard the refutations of the *Flying Post* puff? Well, in a mania people do strange things. Among other factors, FOMO (“fear of missing out”) warps judgment. And then there is the thought that if everyone around you is panicking, while you stay cool, perhaps they know something you don’t. There is a nice illustration of this phenomenon in a letter from a prominent private banker in London in June 1720, when (after a long period of skepticism about the South Sea project) he wrote that “when the rest of the world is mad we must imitate them in some measure” [14]. Even those who acknowledged the fallacies of the *Flying Post* piece could argue that the South Sea Company would be able to make huge profits from its commercial activities. Skeptics such as Archibald Hutcheson, Richard Steele, and others pointed out that there was no plausible way for this company to gain enough to justify the high price of its stock. But the great bulk of the investing public managed to convince themselves otherwise. What is most remarkable is that while the South Sea Company managers did drop various hints, did manipulate stock prices, and handled the financial engineering of their offerings so as to sustain the public’s illusions, they never presented to the public a business plan of how they might succeed. There was nothing comprehensive that was announced other than the piece in the *Flying Post*. In fact, we can say with confidence that South Sea promoters did not even have a plausible business plan internally. The one they were forced to present to Parliament after the collapse of the Bubble showed that they were planning to pay the high dividends they promised out of the capital of the company ([7], pp. 215–222; [8], vol. 3, pp. 231–235). But this was not known to the public before the collapse. The mania reached a new level of intensity in June, and Newton was swept up in the groupthink that ruled the British investing public,
6 Newton as investor

It is noteworthy that once Newton decided to go back into South Sea Stock, he moved essentially all his financial assets into it, and he did it very quickly, with most of his investments in mid-June. Thus he must have been really and truly convinced this was a promising venture. In contrast, the Hall estate, even though it moved funds there earlier, did not “put all its eggs in a single basket,” as much of it remained in Bank of England Stock. The discussions among the trustees and Francis Hall must have been interesting!

Newton was definitely making his own investment decisions, and not simply following advice from others. His choices were different from those of the Hall estate, and also from those of Dr. John Francis Fauquier. Fauquier is an intriguing figure. One of the many Huguenot refugees on the London financial scene, he acted as Newton’s broker, and many of Newton’s financial records that have been preserved are instructions to Fauquier to carry out various transactions. Fauquier was also Newton’s relatively low-paid deputy at the Mint. At the same time, though, he was far richer than Newton, and spent many years as a director of the Bank of England. Like Newton, he did move much of his assets into South Sea Stock, but he did not commit all his funds to that security, and he invested on a schedule different from Newton’s.

In general, Newton was intimately familiar with commodities and finance. He had to be, since his job as Master of the Mint required him to make many decisions that depended on market prices and conditions. The detailed report on currencies that he prepared at the request of the British government in 1717 was an element in the revaluation that put Britain on the path towards the gold standard. The Hill estate papers do cite his activities on behalf of that estate, and the archives at the Bank of England record a variety of occasions when he appeared personally to sign the transfer ledgers. Did he visit Exchange Alley, where financial dealings were concentrated in those days, many decades before a Stock Exchange was created in London? It was not regarded as very reputable, and reports of visits to it by the aristocracy, especially by aristocratic ladies, scandalized proper society. There is a claim in the literature that Newton was seen there ([10], p. 191). However, the reference for that is a letter of the famous London publisher Jacob Tonson, and the actual letter only refers to the possibility of meeting some “Mr. Newton.” It seems likely that an established figure like Tonson would observe the conventions of the time and would refer to the famous mathematician and physicist only by his full appellation “Sir Isaac Newton.” So he probably had another Newton in mind in his letter. (There were several affluent Newtons in Britain at that time.)

Whether Newton frequented Exchange Alley or not, we do have direct evidence of his paying attention to details of operations of individual companies. Another item of direct evidence that has come to light since the paper [12] was written is a letter from Newton to his friend, the mathematician Nicolas Fatio [11]. In that letter, Newton responded negatively to Fatio’s solicitation to invest in a company that Fatio was promoting. He noted the low price of that company’s stock, and that its fundamentals were not good, since he had learned its “rents in Scotland are ill paid & difficultly collected.”

The letter to Fatio also states that “I lost very much by the South Sea company which makes my pockets empty, & my mind averse from dealing in these matters.” This is not
quite as memorable as the famous anecdote that Newton lost so much that he could not bear to hear the words “South Sea,” but it is in Newton’s own words, as opposed to that anecdote, which has only been traced to a period about two generations after Newton’s death [12]. (Newton’s statement is also not very accurate, as his pockets were not empty, he was still quite rich. But this was a handy excuse.)

The general conclusion is that Newton was financially sophisticated, and was making his own decisions. However, unlike Thomas Guy and a small number of other investors, he was not astute enough to avoid the disaster of the South Sea Bubble. But in that he was just part of the immense crowd, which can be estimated at 80% to 90% of all British investors, who did venture into the financial South Sea. This included many of the most sophisticated figures of British commercial life. Thus all we can say is that unlike astronomy, mathematics, and physics, finance was not an area where Newton towered over his contemporaries.

7 Newton, finance, and crowd psychology

There is much evidence that most of the British public was taken in by the Ponzi argument published in the *Flying Post*, and in other forms in a variety of venues. This reflected the relatively low level of financial sophistication in the early modern society that had only recently been introduced to new financial institutions and products. On the other hand, those financial instruments were pretty simple, nothing like the derivatives that have been implicated in the Global Financial Crisis of 2008. And, just as in 1720, we have plenty of modern examples of the bulk of the investing public being bamboozled by specious claims, such as that stock options cost shareholders nothing, or that derivatives serve to disperse risk among those best able to bear it. Thus the key issue is the sophistication of investors relative to the sophistication of financial engineers. There is little sign that this has changed over the ages.

In Newton’s time, there was considerable expertise in valuing conventional financial deals. As an example, his friend Abraham de Moivre was an important mathematician who was at the forefront in the development of probability theory and actuarial science. He never obtained an academic position, but contrary to many reports that claimed he lived in poverty, he had a comfortable career tutoring children of the wealthy and also providing advice on valuations of leases and annuities [3]. There were also the frequent government lotteries, which spawned a subindustry of intermediaries that enabled people to vary their levels of risk. So the society of 1720 did have non-trivial levels of financial expertise.

The South Sea Bubble posed a different problem. There were no well-defined money flows, or even probability distributions. Aside from the Ponzi arguments, which deceived many, but were seen through by others, there were all sorts of vague notions of flourishing trade, strategic alliances, and the like. Some, such as Archibald Hutcheson, saw those were not realistic, but most of the public, including Newton, fell for the humbug. While Newton was generally a careful and successful investor, he did not surmount the challenge of the South Sea Bubble.
Newton was brilliant, but he was not a universal genius. He did much to improve the efficiency of the Mint [2], but he did not invent the method of least squares or some of the other statistical techniques that might have helped further. He played an important role in setting up the Longitude Prize, and helped dispose of many crackpot submissions to the body in charge of awarding that prize, but he was wrong in being skeptical about the feasibility of using clocks in that setting [17]. And, of course, he spent years on alchemy and theology, with little to show for that effort. In the words of John Maynard Keynes [9],

Newton was not the first of the age of reason. He was the last of the magicians, the last of the Babylonians and Sumerians, the last great mind which looked out on the visible and intellectual world with the same eyes as those who began to build our intellectual inheritance rather less than 10,000 years ago.

That he was able to achieve so much in astronomy, mathematics, and physics was due largely to his coming at the right time, when solid foundations had been laid by people like Brache, Descartes, Galileo, Huygens, Kepler, and Pascal. He really was able to “stand on the shoulders of giants.” In the finance of the South Sea Bubble, as in astrology, he was standing in a swamp, and so even his brilliance did not save him from losses.

References


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