Newton’s financial misadventures in the South Sea Bubble

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Abstract. One of the most popular investment anecdotes relates how Isaac Newton, after cashing in some large early gains, staked his fortune on the success of the South Sea Company of 1720 and lost heavily in the ensuing crash. However, this tale is based on only a few scraps of hard evidence, some of which are consistently misquoted and misinterpreted. Much of what has been published is embellished with questionable flourishes. A superficially plausible argument has also been made that he did not lose much in that period, and John Maynard Keynes even claimed Newton successfully surmounted the South Sea Bubble. This paper presents extensive new evidence that while Newton was a successful investor before this event, the folk tale about his making large gains but then being drawn back into that mania and suffering large losses is almost certainly correct. It probably even underestimates the extent of his financial miscalculations. Incidentally to the clarification of this prominent issue, a controversy between Dale et al. and Shea about an aspect of market rationality during that bubble is settled. Some new information is also presented about Thomas Guy, famous for making a fortune out of the Bubble that paid for the establishment of Guy’s Hospital, and other investors. The work reported here suggests new research directions and perspectives on bubbles.

1 Introduction

The South Sea Bubble of 1720 is one of the earliest, largest, and most studied instances of investment manias and crashes. It is frequently cited as the prototypical case of irrational exuberance. Isaac Newton’s role in it is especially fascinating to the public. Tales abound of how he invested early, and cashed out with 100% profits as prices went to what seemed to him unjustified levels. But then, as prices continued to advance, he supposedly invested again at the peak and lost most of his fortune in the crash that followed. He is claimed to have said that “I can calculate the motions of the heavenly bodies, but not the madness of people,” and supposedly could not bear to hear of the South Sea affair to the end of his life.
The interest in Newton’s activities in the South Sea Bubble is surely due primarily to his fame as one of the greatest scientists in the world. But this interest is also very likely magnified by the fact that he was not an other-worldly researcher ignorant of finance. Aside from the effort he put into alchemy and theology as well as into astronomy, physics, and mathematics, he was an accomplished administrator, technologist, and engineer. As first Warden and then Master of the Royal Mint, his efficiency improvements were crucial to the success of the Great Recoinage of the 1690s and later operations, cf. [4]. His broad range of skills is illustrated also by work at the Mint as a detective, in pursuit of counterfeiters [28]. Newton was a member of the British governing elite, and his policy recommendations played what scholars generally think was an important part in Britain’s move, later followed by most of the world, from silver to gold as the monetary standard. Aside from the great scientific reputation he enjoyed during his life, he was paid well for his duties at the Mint, and in spite of any losses in the South Sea Bubble, died a very rich person. This paper provides evidence that before that mania, he was a shrewd and successful investor, too. That a person of such ability, knowledge, and connections could lose his head in a mania is therefore frequently cited as an example of the difficulty of recognizing bubbles.

Various versions of this tale of Newton’s misadventures in the South Sea Bubble are presented uncritically in the press and on the Web, and sometimes even in more scholarly works, as in [8], pp. 108, 165; [9], p. 88; [18], p. 13; [24], p. 41; [51], p. 119. However, deeper investigators of Newton’s life and career, and even some popular writers of books about Newton, do emphasize that this tale is based on extremely limited information about his investments, cf. [10][11][22][55]. The entirety of the evidence available until now in the literature, which is described in Section 6, consists of two anecdotes that we can only trace back to a generation or two after Newton’s death in 1727, and seven reliable quantitative items. Of those seven, one is the inventory of his very sizable estate at death, and five are Newton’s letters instructing his agents to carry out transactions with some of the securities he possessed. As will be shown, three of those seven pieces are consistently misinterpreted and misquoted. Those mistakes lead to misleading evaluations of Newton’s actions and to faulty inferences about his attitudes towards the South Sea Bubble.

The scarcity of comprehensive data about Newton’s investments allows for varying views of what he did during the South Sea Bubble. In 1931, Richard de Villamil used the inventory of Newton’s estate, which he located in court archives, together with the published information that was then available about Newton’s earnings at the Mint, to suggest that Newton probably did not lose much [15]. However, de Villamil’s arguments are not very persuasive, as they rely on extensive assumptions to fill in gaps in the evidence. Further, after his work, additional facts about Newton’s involvement in the Bubble have come to light, and they raise doubts about his conclusions. This paper shows in addition that de Villamil misunderstood the nature of some of the securities that Newton was involved with and made some clear errors in his analysis. Still, de Villamil may have influenced John Maynard Keynes, who went beyond de Villamil in putting Newton’s involvement in the Bubble in a positive light. Keynes claimed that Newton “was a very successful investor of funds, surmounting the crisis of the South Sea Bubble, and died a rich man” [23]. Unfortunately, although Keynes was a careful scholar, made Newton a particular focus of study,
and assembled an exceptional collection of manuscripts related to Newton, as is discussed in Section 15, he did not provide any substantiation for this claim, and it does not seem to have been taken seriously by later scholars. Richard Westfall, in what is regarded as the most authoritative biography of Newton so far, concluded that the available facts “tend to support the story that [Newton] was among those who tasted of the Bubble’s madness” ([55], p. 862).

This paper shows that Newton did not just taste of the Bubble’s madness, but drank deeply of it. His losses, even by conservative accounting, almost surely exceeded £10,000, and plausible methods easily produce values that exceed the £20,000 figure that family lore claimed, and which is frequently cited today. By comparison with typical earnings, and making allowances for a very different society and economy, £20,000 in 1720 might be comparable to £20 million, $20 million, or €20 million today. However, before the Bubble, in the 1710s, Newton’s investments appear to have been those of a careful and shrewd person, and to have been very successful. He was one of the earliest to put money into South Sea securities. Those, contrary to most popular accounts, were very solid and appreciated significantly in the years before the Bubble of 1720. Overall, Newton had a diversified portfolio that did well, helped by a generally rising market. But then, during the Bubble, after initially taking out some large profits, he does appear to have put almost all of his funds into South Sea securities at high prices that collapsed. Had he managed to have perfect foresight and time the market well, he could have emerged, even without using leverage, with over £200,000. That is close to what Thomas Guy got out of the Bubble, and what financed Guy’s Hospital. Newton died rich, with an estate valued at about £30,000, but that is primarily because he was already rich on the eve of the Bubble.

The new evidence on which this paper is based includes a few published items that had been overlooked by previous Newton scholars. Most of the new information, though, consists of detailed and previously unknown accounts of Newton’s investments in various securities. The resulting picture is still incomplete, and is likely to remain so. The ideal source that would provide a definitive view would be something like Charles Darwin’s investment account books. That sage was very modest about his scientific ability and accomplishment, even a dozen years after the publication of The Origin of Species. However, he claimed to be “investing money very well” [5]. Just how well he was investing remains to be determined, but that would only require a modest and routine effort. From the mid-1840s on he maintained detailed records of his finances, and those account books survive. Unfortunately there is no sign of any such records by Newton. The next best thing would be a complete record of Newton’s investments in the South Sea Company. However, those apparently were destroyed in the 1860s, as is explained in Section 7. Hence we have to rely on what little remains.

Fortunately, there are complete records of Newton’s investments in some other securities, which have not been exploited before. This work relies on those of the Bank of England, the East India Company, and several government securities. These records are combined with the corrected versions of previously published items about Newton’s finances, and some contextual information about the South Sea Bubble and the investment scene of that time. The complete long-term records of those holdings, even though they do not cover all
of Newton’s investments, do seem to provide a safer basis of judging what he did than the few episodic items that have been available until now.

Further, although still circumstantial, confirmation of the picture that emerges from those studies of Newton’s financial activities during the South Sea Bubble is provided by the detailed records of a sizable estate of which Newton was one of the executors. Those records, which have not been explored before, come from a document that is available to scholars largely due to Keynes, see Section 15. They provide valuable information about the investment thinking of Newton and the people around him at the time of the Bubble. They also show that Newton was very familiar with the available investment options, and was involved in handling that trust’s funds at a detailed level.

This article could be taken as simply providing more substance to an amusing instance of a genius succumbing to the reigning groupthink at the height of an investment mania. But it is probably much more than that. Larry Neal (31, p. 90) discounted the importance of the South Sea Bubble by writing that it

appears to be a tale less about the perpetual folly of mankind and more about the continual difficulties of the adjustment of financial markets to an array of innovations.

It is probably more accurate to say, of this and many other bubbles, that:

It is a tale about the perpetual folly of mankind in gullibly trusting the arrays of innovations that the finance industry concocts.

In that sense the lessons of the South Sea Bubble continue to be relevant today. Yes, British investors of three centuries ago knew much less than we do, but the financial instruments they faced were much simpler than the ones we are tempted with. It is easy to laugh at some of the arguments that South Sea Bubble advocates were pushing. But future generations will likely also laugh at all the pre-2008 pronouncements by regulators and business leaders, as well as by finance and economics PhDs, about the stability-promoting wonders of CDO-squareds and the nirvana of the Great Moderation. One can even argue that many observers at the time of the South Sea affair understood better than modern ones the essentials of bubbles and of the dangers they pose. But this paper does not dwell on that issue, and concentrates primarily on Newton’s participation in the South Sea Bubble.

This paper avoids a key question, namely the extent to which the South Sea Bubble was a bubble, meaning an episode in which the economic fundamentals guaranteed a collapse. That topic, and the large associated literature, will be treated separately. But the final sections discuss how the data used in this research could provide insights into what should be a key element of bubble studies, namely the diffusion of financial information. In particular, this work shows the relevance in the South Sea Bubble context of the phenomenon that increasingly attracts attention in the modern post-truth world, namely of separate communities of seemingly smart and well-educated people viewing the same facts in wildly divergent ways.

The next section presents a plausible reconstruction of Newton’s investments in the South Sea Bubble. It is based on the detailed analyses carried out later in the paper, and is
just a plausible picture of what may have happened. It thus provides a concise but slightly more detailed overview of the main financial results of the paper than this Introduction.

Section 3 sketches the basic information about the South Sea Company and the London financial scene early in the 18th century. This is followed by a section that explains the Ponzi-like nature of the South Sea Bubble, and considers, but discounts, the possibility that Newton may have been trying to “ride the bubble” in full knowledge it was bound to collapse. Then, in Section 5, various cautionary notes are sounded about projects of this nature, given the limited information that is accessible to us. Section 6 presents all the information that previous accounts of Newton’s investments were based on. Section 7 discusses availability of various types of information about holdings in South Sea securities, as well as South Sea restructurings and operations on investors’ holdings. The following section presents some previously unknown but published information about Newton’s South Sea investments. Section 9 is the first of several that go into the new evidence about Newton’s investments in various securities, such as those of the East India Company, the Bank of England, and his involvement with South Sea securities during the Bubble in 1720. Those sections also speculate about what Newton must have been thinking in order to justify his financial moves.

Close to the end of the paper, Section 14 settles a question about the nature of a particular financial operation of the South Sea Company, the Fourth Money Subscription. This was the last operation of this company before the rapid and spectacular deflation of the Bubble. The somewhat technical issue considered in that section is important in evaluating Newton’s participation in that maneuver. It also serves to settle a recent controversy between Dale, Johnson, and Tang [12,13,14] on one side and Shea on the other [41,42] as to whether the pricing of some South Sea securities at the height of the Bubble was rational or not. The newly discovered evidence of this paper shows that the arguments of Dale, Johnson, and Tang for irrational pricing are not valid.

Section 15 covers the investments of the Thomas Hall estate. Most of the securities transactions carried out by that estate during the South Sea Bubble were stimulated by the main beneficiary of that estate. However, Newton was one of the executors, and being legally responsible, must have at least consented to the moves that were made. We also have evidence that he was actively involved in administering the estate. Hence the evidence we obtain is circumstantial, but it does provide illuminating hints about Newton’s views and actions. It is likely that his change of mind about prospects of South Sea investments came about at least partially because of discussions about the Hall estate.

The next-to-last section discusses behavior during the South Sea Bubble of various investors. The main focus is on Dr. John Francis Fauquier and Thomas Guy. Fauquier is a little known figure who turns up frequently in financial records as Newton’s agent. But he was more than that, as he was a major financier, a director of the Bank of England, and Newton’s deputy at the Mint. Little is known about him, but the contrasts and similarities that come out of comparing his investments to Newton’s are intriguing. Thomas Guy was the famous founder of Guy’s Hospital, and is known to have made much of the fortune that he left for that purpose by selling out his South Sea investments as the Bubble was inflating. Section 16 presents a brief study of Guy’s accounts. He did liquidate his South
Sea holdings, as has been widely published, but the new research for this paper shows he did repurchase some during the Bubble. However, those moves were likely driven not by a change of heart, as in Newton’s case, but by special circumstances, trying to cover short sales.

Finally, the Conclusions section summarizes the results of this investigation. It also suggests some further investigations, involving social network analysis, of the account data this work relies on. Such investigations could provide valuable information about the dynamics of bubbles.

2 A brief and tentative summary

Previously known quantitative information about Newton’s investments was exclusively in the form of occasional snippets of data that gave just the volume of his holdings in some particular securities and only at certain points of time. The research of this paper adds to that long-term records of his investments in various securities. These show that Newton seldom made any changes to his long-term holdings outside the Bubble year of 1720. This is in contrast to what Harris found for the composer and musical entrepreneur Handel, say [19,20]. That means we do not obtain all the additional information about Newton’s life and activities that Harris extracted from Handel’s accounts. But it also means that the few episodic items we have for securities for which we don’t have complete records, in particular the key South Sea Stock holdings, are likely to be representative for the relevant periods. Even so, there are still huge gaps in our knowledge, and the many pitfalls in any attempt to reconstruct Newton’s financial dealings are covered in some detail in Section 5.

Fig. 1 presents a graphical representation of purchases and sales of South Sea Stock during the Bubble, against the background of market prices of that security, for both Newton and Thomas Guy. (What the word ‘stock’ means is explained in the next section.) The dates of Guy’s sales are precise, taken from his account books.

The period of Newton’s sales shown in Fig. 1 is estimated, based on the one sale instruction that has surfaced, and on large purchases of government securities that he made. Those are assumed to have been made with proceeds from sales of South Sea Stock. The first of the four purchases by Newton is also surmised, and is the date on which he liquidated most of his large holdings of government securities. The last two events, marked “Newton buys for Hall,” represent purchases for the Thomas Hall estate, largely at the request of the main beneficiary of that estate. Those purchases, and earlier ones not shown in the figure, are discussed in Section 13. Newton was just one of four executors, so we cannot be certain how he felt about that operation. However, he presumably at least did not object very strongly to this purchase, which shows continuing faith in the South Sea project even as it was more than halfway through its precipitous fall.

The bulk of this paper considers in detail various individual securities. Here we sketch a plausible hypothetical scenario of Newton’s investments, one that is consistent with available data and with the patterns of behavior we find in Newton’s accounts. Some smaller sums are ignored here. Those include the one discussed in Section 13 which is important in trying to divine Newton’s thinking and is represented by the last of the four
Fig. 1. South Sea stock prices and investments by Newton and Thomas Guy during the Bubble of 1720. Source for prices: *Course of the Exchange* (adjusted for stock dividend). Sources for investment dates: records at the Bank of England, London Metropolitan Archives, and King’s College Cambridge. The vertical lines denote some of the purchases (the first one surmised, others firmly documented), the horizontal lines for sales the periods when those occurred, estimated for Newton and precise for Guy. The gap in prices at the end of June comes from the stop to transfers until the end of August, so that prices switched from those for immediate cash settlement to what were effectively futures deals, and are not strictly comparable. The two lines marked “Newton buys for Hall” represent two of a larger number of purchases for an estate, where Newton was just one of the executors.

vertical “buy” lines in Fig. 1. Only very rough estimates are given, all that can be justified given the gaps in our knowledge. A key element in this reconstruction is the thesis that in mid-1722, Newton’s long-term security holdings consisted almost entirely of slightly less than 22,000 South Sea Stock. We do know he possessed that amount, and an identical amount (aside from some stock dividends that did not involve any action on his part) in mid-1721. We can trace a path, many elements of which we have solid documentation for, by which this stake led, through a diversification move and some additional savings, to the entirety of the long-term holdings in his estate at death. Once we accept this inference about Newton’s possessions in mid-1722, the various operations documented later in this paper that he carried out during the 1720 Bubble year limit what he could have possessed
even before 1720. They also limit what he could have done in 1720 aside from what is described here.

Keeping all these caveats in mind, it appears that at the start of 1720, before the South Sea Bubble started inflating to a serious extent, Newton probably had about 10,000 units of South Sea Stock, with market value of about £13,000, as well as government securities worth around £19,000, for total portfolio market value of £32,000. By mid-1722, it is overwhelmingly likely that his entire investment consisted of about 22,000 South Sea Stock mentioned above, with market value of £21,000. This indicates a loss of about £11,000, and likely somewhat more, around £13,000, compared to what he would have had if he had not done anything in 1720 and just let his securities sit. (These figures do not include dividends, which were on the order of 5% per year on the market value.)

It is easy to see how Newton may have told his family of even larger losses. It seems that early in 1720 he liquidated the bulk of his South Sea holdings for a profit of about £20,000, and not just the £7,000 that is frequently cited. But a few weeks later he appears to have gone back into the market and spent all that money repurchasing that same security at about double the price. So he could have regarded this pair of transactions alone as producing losses of £20,000 or more.

In mid-1720, Newton also converted his government securities into South Sea Stock. Had he sold them in the market instead of converting, he would have made a profit of about £13,000 compared to what they had been worth half a year earlier, and also compared to what he most likely had paid for them some years earlier. As it was, the conversion led to a loss of around £5,000 compared to the value at the start of the year. So that operation could also easily be portrayed as involving a loss of £20,000 all by itself.

Thus it is easy to see how Newton could have talked of losses of £20,000 or £30,000. Imaginative ways exist to create even larger loss figures, especially when compared to the best possible scenario. Had Newton put all his money into South Sea Stock in June 1719, and sold out close to the peak in June 1720, he would have ended up with something on the order of £250,000.

3 South Sea Bubble basics

This section presents some of the basic facts relevant to the South Sea Bubble. This subject is involved, so most of the detail and background information has to be omitted. For more information, see the numerous books on this topic, such as [2,8,12,16,38].

Comparing living standards and costs over a span of three centuries and tremendous changes in the living environment is very tricky. But, as was mentioned in the Introduction, from the standpoint of an individual, it seems reasonable to take the figures from Newton’s time, given in pounds sterling, and multiply them by 1,000 to get today’s rough equivalents, since typical annual earnings grew by about that factor. Given the uncertainties in such an exercise, that same 1,000 factor applies to conversion into any of modern pounds sterling, US dollars, or euros. To show that this produces reasonable results, let us note that Newton’s pay as Lucasian Professor at Cambridge was around £100 per year, while his total earnings from his job at the Mint were in the range of £2,000 per year ([15], pp. 32–4).
For comparisons at national level, a more appropriate multiplicative conversion factor might be 10,000 or even 100,000. The British national debt in 1720 was around £50 million, and the annual peacetime budget was under £5 million, with about half devoted to debt service, and most of the rest to the military.

Fig. 2. Stock prices of the three dominant joint-stock companies on the London market, from start of 1710 to end of 1719. The South Sea Company stock started trading in late 1711. Source: Course of the Exchange, prices smoothed with the lowess function in the R statistical analysis package.

Of the national debt of approximately £50 million at the end of 1719, about £6.6 million was owed to the Bank of England and the East India Company, almost £12 million to the South Sea Company, and the rest, about £32 million, directly to the public. Of that £32 million held by the public, about half was in the form of so-called Irredeemables. These were all administered by the Exchequer, and in modern terminology were terminable annuities. They paid fixed amounts per year until their termination, and nothing thereafter, with no return of principal. The terms were fixed, and the only way the government could do anything with them was to repurchase them in the market, or else (as happened in the South Sea Bubble) persuade holders to swap them for something else. They continued to be used in British government finance later on. However, by the 19th century they formed a tiny fraction of the national debt, although one that provides interesting information.

1 For more precise accounting, see [16], around p. 93.
about market efficiency and cultural factors in finance [34]. Just before the South Sea Bubble, though, they formed close to a third of the national debt. Most of the capital of the Irredeemables that existed in 1720 was in the form of 99-year annuities issued between 1705 and 1709. Thus they had around 80 years left to their lives at the time of the Bubble, and were often called Long Annuities.

There were also the Redeemables. Some were administered directly by the government, and will be called Exchequer Redeemables here. Some were administered by the Bank of England, and will be referred to as Bank Redeemables. They were of the same form as the most famous British government securities, the Consols, which were created in mid-18th century and dominated British government finance until the end of the 19th century. They were ‘perpetual’ in the sense that they paid a fixed rate on the nominal (par) amount, and did not have a termination date, so investors could not cash them in other than by selling to others in the market. On the other hand, the government had the right to redeem them at the par value.

As we will see, before the Bubble, Newton owned both Irredeemables and Bank Redeemables. It appears that he converted them all, either through market purchases or through the South Sea ‘subscriptions’ to be described later, into South Sea Stock at the height of the Bubble.

Equity investors in the three main joint-stock companies on the London market, the Bank of England, the East India Company, and the South Sea Company, held what was called ‘stock’ in them. This was similar to shares, but was strictly a book-entry security, and the general guideline was that 50 units of stock of a company corresponded to an initial investment of £50 in cash. Prices of stock were universally quoted for units of 100 stock, but stock could be, and was, traded in tiny increments of 1/240 of 1. When a dividend was listed as being at the 6% level, it meant that for each 100 units of stock, £6 was paid each year. If those 100 units were trading at 120, this meant a dividend yield of 5%, of course, but published reports were always based on the par figure.

It is important to remember that the three ‘moneyed companies’ discussed above had much of their capital tied up in loans to the British government, loans that paid basically market rates of interest. (In 1720, those rates were actually above market, as interest rates were declining.) Thus much of their income consisted of stable flows of funds from the taxpayers. This was especially true for the South Sea Company. Its commercial activities were negligible in size, cf. [17,37], although prospects of their flowering and producing bountiful profits were critical to the Bubble. This enterprise was thus basically just passing on the funds it was receiving from the government to its stockholders.

Until the Bubble of 1720, the South Sea Company was a very successful institution. It started out as an innovative experiment, so one could argue that the early investors in it, such as Newton, Guy, and Fauquier, were adventurous. But it quickly turned out to be successful, and represent very solid finance. In fact, as was mentioned above, the South Sea Company owned almost twice as much government debt as the Bank of England and the East India Company combined. Its creation in 1711 was motivated by several factors, such as desire to expand foreign trade, to allow the Tories to wrest control of British finance from the Whigs, and, most important, to solve an urgent problem of British government
finance, namely the accumulation of a large volume of unsecured short-term debt. This debt consisted basically of promises by officials to suppliers as well as sailors that their claims would be paid by the government as soon as cash could be found. Given the pressures of financing a war, this cash was not likely to materialize any time soon, and so this debt traded at a deep discount. The South Sea Company converted this short-term debt into long-term one. Owners of the short-term unsecured paper were invited to ‘subscribe’ it into South Sea Stock, and most did so. The result was a great success for both the government and investors. As is shown by Fig. 2 investing in South Sea Stock was noticeably better than in the Bank of England Stock in the 1710s, although not as lucrative as in the East India Company Stock. Newton was an early investor in South Sea Stock, and generally appeared to be adding to his holdings in that security in the 1710s, as is shown in Section 8.

The large jump in the price of South Sea Stock that appears at the tail end of Fig. 1 is not an artifact. The announcement at a shareholder meeting on 30 September of a tentative agreement (which was not carried out in the end) for the Bank of England to effectively purchase a large allotment of South Sea Stock at a price of 400 led the market price to jump from about 200 to about 300. Afterwards it basically drifted down to about 120 in mid-1721 (just about its price at the end of 1719), with various oscillations that depended largely on political developments, as Parliament took control.

The prices of South Sea Stock in Fig. 1 are adjusted for the mid-year 10% stock dividend, which is discussed in Section 7. Comparison of prices in the two main sources for that period, Castaing’s *Course of the Exchange* and Freke’s *Prices of Stocks* shows that starting 2 July 1720, Castaing was quoting prices excluding that dividend. Hence prices shown in Fig. 1 were increased by 10% from those in the *Course of the Exchange* from that date.

It is worth noting that South Sea Stock was an extremely successful investment for those who put in money at just about any time before the Bubble, and did nothing during the Bubble. Consider someone who bought South Sea Stock as late as mid-1719 and went on a long trip around the world. Upon return in mid-1723, that person would have been rewarded by an almost 50% capital gain, in addition to market rates of dividend, as is shown in Table 1. The main reason for this was that the South Sea Bubble had a substantial element of a Ponzi scheme built into it, as is discussed in Section 4. Early investors benefited at the expense of later ones.

During the Bubble, investors could buy South Sea Stock in the market. In addition, there were four Money Subscriptions, discussed in Section 13, in which investors could sign up to purchase this stock with cash, by putting down a deposit and paying the rest on an extended schedule. Further, there were two “subscriptions” for the Irredeemables, and two for the Redeemables, in which owners of those securities signed up to convert them into South Sea Stock.

Financial data expressed in pounds is converted into decimal format, from the pounds, shillings, and pence format of that time. Figures are almost always rounded.

Finally a word about the calendar. Until 1752, England relied on the Julian calendar, which in the early 18th century was 11 days behind the Gregorian one that had been

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2 This table only shows a 36% gain from November 1719 to August 1723, but that reflects the runup in South Sea Stock prices in late 1719.
adopted in most of Western Europe. In this paper, months and days are given in the Julian style that was used in England. However, years are altered somewhat. In England, the official year started on 25 March until 1752, although unofficially many people and press organs were using 1 January as the start of a new year. Hence Newton’s death, which by official dating took place on 20 March 1726, occurred on the day that was 31 March 1727 in France. In common with most modern works, in this paper New Year’s Day is taken to be 1 January, so that Newton’s death is taken to have occurred on 20 March 1727.

4 Ponzi schemes before Ponzi and the madness of people

Modern financial literature often invokes the term “rational bubble” that is rather misleading. What it means is not that the bubble itself is rational, but rather that rational investors invest in that bubble in spite of expectations that it will collapse, based on hopes they will be able to get out before that collapse, selling to a “greater fool.” Could that have applied to Newton? If so, it would provide an unusual interpretation for his comment about not being able to “calculate the madness of the people.” It could have come from his attempting such a calculation, guessing how many more fools there were, and just how foolish they were, but not getting that measure right. But while this is a fascinating idea, it is unlikely to be true.

The South Sea Bubble had, in common with many generic features of bubbles, a large element of a Ponzi scheme. Each successive wave of investors brought in either cash or government securities at ever higher valuations of South Sea Stock. This was increasing the value of the stock owned by the previous waves. This was recognized by many contemporary observers. The little piece by Archibald Hutcheson from 1720 in particular is cited as a masterpiece of simple and transparent exposition of this phenomenon in ([2], vol. 2, pp. 302–303) and in later works. The Ponzi aspect of the Bubble has also been covered by some modern writers, such as [21]. This could have been conducive to some investors realizing they were getting in at unrealistically high prices, but hoping enough “greater fools” would come in at even higher prices.

Could Newton have engaged in such thinking? This seems unlikely. He does appear to have cashed in most of his profits in April and May 1720, so he appears to have been skeptical of the prospects of the South Sea Company at that time. But once he got back in, in June, he appears to have simply continued putting in ever more of his financial resources into the South Sea venture. There is no sign of his trying to cash anything in after mid-June, as one would expect from a player trying to ride the bubble but taking some precautions. If Newton was counting on more “greater fools” showing up, he was counting on an unrealistic number of such.

5 Newton and his finances

There is extensive data about Newton’s income, first from Cambridge University, and then from the Mint, where most of his earnings came from fees based on the volume of business transacted, cf. [1355]. Around 1720, his Mint earnings were apparently somewhat over
£2,000 per year, although with large fluctuations, depending on the volume of business at the Mint ([55], pp. 606–607). In addition, dividends on his investments were likely around £1,500 per year. But much less is known of what he did with his money. He did not have an account with the Bank of England, unlike Fauquier, cf. Section [16] nor with some of the few banks whose records from that period survive, such as Coutts, Goslings, or Hoare. His living expenses must have been considerable, likely higher than de Villamil [15] surmised, as he “adopt[ed] the style of the better circles of London society” ([55], p. 580). Still, those expenses were unlikely to exceed £1,000 per year, given what we know of how the upper classes lived in those days, and that Newton was not among the ostentatious spenders. But then he also made many gifts, to the Royal Society as well as to his numerous relatives. This makes it very hard to reconstruct his finances. But he had money to spare, and the general pattern we can see among those of his investments for which we can find even fragmentary records is of general increase.

Long-range financial investments that were available in England were primarily in government securities and those of the three “moneyed companies,” the Bank of England, the East India Company, and the South Sea Company. So if Newton’s investments were in any way similar to those of a capitalization-weighted index for London, they would have been concentrated in those securities. Most of those securities were covered by the investigation for this paper. But there are some more that can be looked at. In particular, some of the records of the Exchequer Redeemables and Irredeemables which have not been looked into survive in the parchment rolls at the National Archives [16], and might clarify some of the issues left open by this paper. Further, more insight into Newton’s level of attention to the markets and his interactions with agents such as Fauquier could be obtained by studying the transfer books for the securities administered by the Bank of England, in the way that was done by Harris for Handel [19,20].

Records of some other joint-stock companies from that period that Newton might have invested in do exist. That is the case, for example, for the Million Bank, which by 1720 was the equivalent of a mutual fund investing in government securities, and also for some insurance companies. What would be most interesting to learn, but appears impossible to obtain any information on, is whether Newton was involved in any of the new projects which were springing up like the proverbial mushrooms during the South Sea Bubble. A particularly interesting example is that of Richard Steele. He is known best for his illustrious political, journalistic, and literary career. He was also one of the most vociferous and convincing debunkers of the South Sea Bubble. However, from the mid-1710s through the Bubble he devoted much of his time and money to his Fish Pool project, for bringing fresh fish to central London. He noted that he had discussed this venture with Newton ([49], p. 342), and it would be fascinating to learn what Newton’s reaction was, and whether he was tempted to put any of his money into it.

The main point of this discussion is to emphasize that an investigation like this one cannot ever be conclusive. There were just too many possible investments outside those covered here that Newton could have been involved in. We can only obtain circumstantial evidence. But with enough such evidence, if it is consistent, one can obtain moderate confidence in the picture that emerges, and that is the hope for this work.
An issue that arises frequently in investigating investments is that securities may be held under names other than those of the beneficial owners. Many of the investors discussed in the Laurence papers [25, 26, 27], for example, had their securities registered under the name of Henry Hoare, their banker. Some of the investments for the Hall estate, where Newton was one of the executors, were registered to Hopton Haynes, who was another executor, and is discussed in Section 15 and later. However, no sign has been found that any of Newton’s funds were held by someone else, or vice versa, at least at the individual level.3

A closely related major potential pitfall in any investigation of Newton’s finances has to be discussed in detail. Hall and Tilling, the editors of vol. 7 of Newton’s Correspondence ([33], vol. 7, pp. 96–7) are incorrect in some of their commentary on Newton’s 27 July 1720 letter. This is discussed in Section 6 point E, and in Section 12, and is due primarily to inadequate knowledge of the nature of the investments of the South Sea Bubble era and to reliance on the faulty discussion of de Villamil [15]. However, they do make a very valid and important point “as a caution against any one attempting to reconstruct Newton’s income, or the magnitude of his estate.” This was that Newton often had large Mint funds in his possession. This was completely legal and common in those days, with civil servants commingling private and official funds in the same accounts, and making personal profits by investing the taxpayers’ money. Surviving Mint records show that before 1720, Newton often held large amounts of such funds4. At the end of 1720, Newton’s Mint balance was down to £11, but afterwards grew again, so that the last surviving account, for year-end 1726, had a balance of over £22,000. As Hall and Tilling write, “[p]resumably Newton did not hide this sum in his mattress but invested it securely; it is impossible to say what fraction of his holding of, say, South Sea Stock, at any time was ‘really’ his own.”

Investing running balances of public funds in long-term securities would generally be considered not just risky, but foolhardy. But manias often lure people into investments that look very foolish afterwards. A notorious South Sea Bubble case involved masters of Chancery. These were officials of the Court of Chancery who had custody of funds that belonged to parties engaged in lawsuits in that court, or else to minors who were wards of that court. These masters invested large sums of this nature in South Sea Stock, resulting in huge losses. The scandal was of such magnitude that Parliament ended up creating the position of the Accountant-General of the Court of Chancery. This person was not an accountant in modern terms, and instead was charged with custody of funds held by that Court, and had to follow rigid procedures for handling such funds to prevent a recurrence of this debacle [52].

In Newton’s case, the safe course of action with Mint funds would have been to invest them in secure short-term instruments, such as the bonds of either the South Sea or the East India Company. These were bonds in the modern terminology, with capital repaid at the end of their term, which was typically a year or less. They paid about 4% per year around 1720, and were very secure, since both of these companies held large volumes

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3 One joint account in the names of Haynes and Newton was found, which lasted a year and held 1,000 Bank of England Stock for the Hall estate. See Section 15.

4 All data about Mint funds that is cited here is drawn from the Hall and Tilling commentary in [33], vol. 7, pp. 96–7.
of government securities. Those were bearer instruments, so no systematic records have survived of who held them.

It seems most likely that Newton did buy securities such as those bonds, rather than put Mint money into South Sea Stock. Hall and Tilling sketch a hypothetical scenario in which the known liquidation of part of Newton’s South Sea Stock in April 1720 (point D of the next section) might have been for the purposes of reducing his Mint balance. But that does not appear to fit well the pattern of his other investment moves at that time, which were not known to Hall and Tilling, as they are presented here for the first time. They are discussed in Section 11. Further, Hall and Tilling cite the transfer of Newton’s Mint balance on his death of £22,278 to his successor John Conduitt on 13 May 1727, and suggest that it may have come from his estate. That is not impossible when we consider just the magnitude of his ‘sworn estate,’ which came to £30,333 ([15], p. 34). But it is impossible when we look at the precise timing and at what that ‘sworn estate’ contained. Almost all of it consisted of holdings of Bank Stock, South Sea Stock, and South Sea Old Annuity. Disposal of Bank Stock is recorded in ledger AC27/444:1105, and of South Sea Old Annuity in ledger AC27/6447:169. (These are references to Bank of England Archive collections, and are explained in Section 7. Records of South Sea Stock transactions have not survived, as is explained in the same section.) In both cases the entire balance in Newton’s account was divided up among his heirs on 18 May 1727. So it seems safe to conclude that Mint funds were taken out of Newton’s estate before it was ‘sworn to,’ and so were not part of the £30,333 that was reported to the probate court. Mint balances were likely held in separate accounts. These records of the 18 May 1727 distribution to heirs also help clarify the questions about the fate of Newton’s estate that are presented as somewhat doubtful in ([55], pp. 871–72).

For the rest of this paper it will be assumed that the long-term securities that are visible in Newton’s accounts were his personal property. But it is wise to keep the Hall and Tilling warning in mind, as it might be the source of a fundamental misunderstanding of Newton’s finances.

6 Data sources

The published accounts of Newton’s involvement with the South Sea Company are all based on just nine items:

- A. Spence’s collection of anecdotes contains many items about Newton. One of them cites Lord Radnor as reporting that “[w]hen Sir Isaac Newton was asked about the continuance of the rising of South Sea Stock,” he responded “that he could not calculate the madness of the people” ([47], p. 368). This is the earliest known version of the “madness of the people” story, and appears to have inspired all others. It does not have the extra flourish about computing “the motions of the heavenly bodies” that is common. Apparently that was added later by other writers. The phrasing as reported by Spence appears to imply this incident occurred in an early phase of the Bubble, and not during its aftermath.

The “madness of the people” quote, the earliest that has been found, was published in 1820. However, that volume was based on notes collected much earlier by the literary
scholar Joseph Spence, who lived from 1699 to 1768 [29], and this particular item was taken from Spence’s “Second memorandum book, 1756.” Spence was very well-connected in British society, and his Anecdotes are frequently cited by modern scholars. They are Spence’s “chief claim to fame,” and “[reflect Spence’s nature]: self-effacing, conscientious, discriminating, knowledgeable, and kindly” [29]. However, while there is no reason to doubt that Spence reported this item as he heard it, he was occasionally not very “discriminating” in his collection. For example, he also reported that according to Alexander Pope, his most important source, “Sir Isaac Newton, though so deep in Algebra and Fluxions, could not readily make up a common account: and, when he was Master of the Mint, used to get somebody to make up his account for him” ([47], p. 175). To anyone acquainted with Newton, this is preposterous. While it is likely that he did have assistants prepare most of his accounts at the Mint, as he was the Master, and had a substantial staff, he was more than capable of preparing accounts himself. In any event, this item comes from a generation after Newton’s death.

The latest edition of Spence’s Anecdotes [48] contains extensive additional material from Spence’s collections that has been found since 1820. However, it does not shed substantial new light on Newton’s finances. James Osborn, the editor of [48], identifies Spence’s informant “Lord Radnor” as John Robartes, the fourth Earl of Radnor. This person lived from 1686 to 1757, and so may have been reporting to Spence his personal interaction with Newton, as opposed to a second-hand story.

– B. In 1797, William Seward wrote, in a longer passage about Newton, that “Sir Isaac, indeed, was in one respect but too like the common race of mortals: his desire of gain induced him to have some concern in the fatal bubble of the South Sea; by which (as his Niece used to say) he lost twenty thousand pounds. Of this, however, he never much liked to hear; ...” ([39], p. 99).

William Seward, who lived from 1747 to 1799 [29], is known primarily for his collection of anecdotes, just like Spence. The quote above does not appear in the 3rd edition of 1796 of his Anecdotes, but does in the 4th and 5th editions of 1798 and 1804 [40] which incorporate material from the 1797 supplementary volume [39] that first presents the quote. Seward appears to have taken care to obtain confirmation for what he publicized. The European Magazine in 1791 carried an anonymous piece about Newton, which surely was by Seward [4]. That item stated that “Sir Isaac Newton lost a considerable sum of money in the famous South Sea Bubble of 1720” without mentioning any figure, and then went on to talk of “one of his nieces.” In the 1797 Supplement [39] quoted above, he was more specific, and not only stated the £20,000 figure, but referred to “his Niece,” which reflects knowledge that there was only one niece that could realistically have been involved. This was Catherine Barton/Conduitt, Newton’s half-niece. She was Newton’s closest and favorite relative, kept his house for him for many years, and stayed in frequent contact with him. Her husband, John Conduitt, was a deputy to Newton at the Mint and later his successor in that position [29]. So it is likely that sometime

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5 An extensive discussion of the importance and reliability of Spence’s accounts is presented by Osborn, the editor of [48], in that version of Spence’s Anecdotes.
6 The European Magazine, May 1791, p. 340. Seward published many of his anecdotes in that serial, as well as in other ones, before publishing them in book format.
around 1796, Seward received some additional information to supplement the initial bit he had acquired. But this was two generations after Newton’s death.

- **C.** A letter dated 1 September 1713 instructing the South Sea Company to pay Fauquier the dividend due to Newton at the end of June on 2,500 South Sea Stock he owned at that time (\[33\], vol. 6, p. 27).

- **D.** A letter of 19 April 1720 authorizing and instructing Fauquier to sell 3,000 South Sea Stock that Newton owned, stating explicitly that this was only part of his holdings (cited in \[33\], vol. 7, p. 96).

- **E.** A letter of 27 July 1720 authorizing and instructing Fauquier to subscribe various Irredeemables Newton held that brought in £650 per year into South Sea Stock (\[33\], vol. 7, p. 96). The clear implication of that letter is that this was the totality of such annuities that he then had. This letter has been misinterpreted (cf. \[30\], p. 653; \[15\], p. 25) by authors who did not understand what securities were involved, as will be discussed in Section 12.

- **F.** An undated letter instructing the South Sea Company to transfer to John Read all the South Sea Stock that was due to Newton for his payment of £1,000 in the 4th Money Subscription (\[33\], vol. 7, pp. 358–359). The editorial note to this letter misdates that subscription, and says that it “took place at the beginning of June 1720.” This appears to have led to reports that Newton had invested £1,000 in South Sea Stock in June 1720 (e.g., \[55\], p. 861). As is explained later, that investment must have occurred on 24 August 1720, and the transfer to Read must have taken place no earlier than the end of February 1721.

- **G.** A letter dated 8 August 1722 instructing the South Sea Company to pay Fauquier the dividend due to Newton at the end of June on 21,696.32 of South Sea Stock (\[33\], vol. 7, p. 210).

- **H.** A report in Dickson’s book (\[16\], p. 279) that at some point in 1723–24, Newton possessed 11,000 of Bank of England Stock. The relevant passage in Dickson is slightly ambiguous, as it takes some effort to decide where his discussion of large owners of East India Stock moves on to large investors in Bank Stock. This has led to the misreading (cf. \[55\], p. 862) that Newton held 11,000 of East India Stock at that time. However, this is a mistake, Newton’s 11,000 of stock was in the Bank of England. Newton’s investments in both the Bank and the EIC are discussed in detail later.

- **I.** Inventory of Newton’s estate at death, found by de Villamil. This estate contained (in addition to some cash, real estate, and various sundries, none of which were long-term marketable securities) 14,000 of Bank of England Stock (worth then approximately £17,500), 5,000 of South Sea Stock (worth about £4,900), and 5,000 of Old South Sea Annuities (worth about £4,800) (\[15\], p. 34).

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7 Valuations presented here are taken from prices in the Course of the Exchange on the day of Newton’s death, and include accrued dividends. Hence they are slightly different from those in de Villamil’s book, which are based on the sworn valuation presented by the executors at a later date.
Contrary to many popular accounts, the South Sea Company did not perish in the crash that followed the Bubble. In fact, by early 1722 it administered over 80% of the British government debt. Although that declined somewhat in the next few years, as restructuring shifted some of that debt to the Bank of England, the South Sea Company continued to be the dominant administrator for the national debt through mid-18th century. The imposing new South Sea House, completed in 1727, was a prominent landmark in the City, the financial and commercial hub of London. It preceded the first purpose-build facility of the Bank of England, which was only completed in 1734.

Eventually the South Sea Company did dwindle into insignificance. By mid-18th century it gave up its feeble and unsuccessful attempts at commerce and whaling, and became just a financial operation, administering a fraction of the national debt. This fraction kept declining because of the growth of the debt processed by the Bank of England and by market repurchases of South Sea annuities by the government. The company was finally dissolved in the 1850s, and its last few decades provide an illuminating picture of the evolution of British finance in the 19th century [35]. Unfortunately that dissolution appears to have led to the destruction of the ledgers containing records of investments in South Sea Stock. What has been left are some corporate records (minutes of the meetings of the board of directors and the like, but not the financial reports), which were donated to the British Museum, and are now at the British Library, and ledgers of the several kinds of South Sea annuities.

In early 1723, South Sea Stock still made up over 70% of the British national debt. It was then split in half. Effective 25 June 1723, an owner of 100 of South Sea Stock became the owner of 50 South Sea Stock and 50 Old South Sea Annuities. These annuities were now the direct obligation of the British government, with the South Sea Company just the administrator, and paid a fixed interest rate. Any profits or losses from commercial operations of the South Sea Company belonged to owners of South Sea Stock. Upon dissolution of this enterprise in the 1850s, South Sea Stock ledgers were retained by the trustees who for some years had custody of residual funds held in case some claimants showed up. When even this small operation was wound up in the 1860s, those ledgers were presumably discarded, as they were not among the papers transmitted to the British Museum. On the other hand, the ledgers of Old South Sea Annuities were moved in the mid-1850s to the Bank of England, where they are available for study.

Old South Sea Annuities ledgers, items AC27/6437 through AC27/6452 in the Bank of England Archive, contain complete information about holdings of these annuities from their inception in 1723 to 1728. In particular, the initial entries, for 25 June 1723, also provide us with a complete record of holdings of South Sea Stock at that time, the only complete record of South Sea Stock at any time that is known. As an example, Newton appears...
in AC27/6447:169 (meaning on p. 169 of ledger AC27/6447) with a starting balance on 25 June 1723 of 5,000 of Old South Sea Annuities, coming from “Joynt Stock” of the South Sea Company. This means that on the preceding day he must have had 10,000 of South Sea Stock, and as of 25 June he had 5,000 of South Sea Stock and 5,000 of the Old Annuity. This same ledger shows that Newton did not touch his Old Annuity holdings until his death, aside from collecting dividends, and they were divided among his heirs two months later, on 18 May 1728. Since Newton possessed 5,000 of South Sea Stock both on 25 June 1723 and on his death, and had at least 5,000 at the end of 1723 (as is shown in the next section), it seems a safe assumption, especially given how seldom he made changes to his long-term investments, that he did not touch his South Sea Stock during the intervening period.

Handel’s holdings of Old South Sea Annuities are contained in AC27/6443:[122, 124] (meaning pages 122 and 124 of ledger AC27/6443) and show that he must have had 300 of South Sea Stock on 24 June 1723, cf. [19,20].

We can make some further deductions about Newton’s and Handel’s investments in South Sea Stock from the scarce records that survive by utilizing the information about stock dividends. Those need to be discussed in any case since they are crucial to any general evaluation of investment strategies involving South Sea securities.

The 25 June 1720 dividend on South Sea Stock was replaced by a 10% stock dividend, which meant that a holder of 600 South Sea Stock had his or her holdings automatically increased to 660. Next, in September 1721, as part of the mop-up after the Bubble, investors received another 1/3 stock dividend, so a holding of 660 South Sea Stock was increased to 880. Finally, in yet another step in the restructuring, in April 1723, investors received 1/16 stock dividend, so a holding of 880 South Sea Stock became one of 935. Now Newton’s holdings of 10,000 of South Sea Stock on 24 June 1723, and Handel’s of 300, are not 17/16 of any nice round figures. It appears almost certain that both Handel and Newton engaged in some small transactions between April and June in order to end up with the round figures that they apparently preferred. A similar preference can be found in many other accounts, while a small fraction show starting balances that were exactly 17/16 of a round figure. This appears to be a reflection of the dominant cultural attitude among British investors of that era that long-term financial holdings were meant to be stable, with the dividend income being consumed, and not reinvested. Such moves were facilitated by the South Sea Company, which found it easier to handle dividend payments and the like on round figures. For a short period after the 1/16 stock dividend in 1723, for example, it offered to buy or sell their stock to their stockholders so as to round their holdings to the nearest 2.

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9 Information about the various stock dividends is presented in (2, vol. 2, p. 301), for example.
10 The skipped mid-1720 cash dividend was largely made up by a larger than normal 5% cash dividend at year-end 1720.
11 Minutes of the General Court of the South Sea Company, 29 March 1723, British Library Add MS 25544.
8 Additional information about Newton’s South Sea holdings

In 2017, another financial directive from Newton surfaced at an auction. It was dated 15 November 1721, and directed the South Sea Company to pay to Fauquier the mid-1721 dividend on Newton’s holdings of 16,275.24 South Sea Stock. That provides another hard data point about Newton’s investments.

The late date for this note might tempt one to think that Newton was careless with his money, as it superficially looks like he left collection of dividends due at the end of June to the middle of November. However, such an inference is surely unjustified. The finances of the South Sea Company for much of 1721 were unsettled, and depended heavily on political decisions by Parliament. Hence that dividend was not declared until the shareholder meeting of 1 September. Further, for large holders, like Newton, it was in the form of warrants payable at the end of September 1722, and bearing 5% interest. Since that was a very good interest rate for that time, Newton very likely felt it would be best to wait to collect the full amount in the fall of 1722 instead of selling the warrant early in the market. Hence there was no need to hurry to collect the documents. In contrast, the instructions in Section 6, point G about the mid-1722 dividend were dated 8 August 1722, and that dividend was payable 30 July, so only a short delay was involved.

We next consider some obscure but published information about South Sea Stock holdings that involve Newton and that has not been considered by previous scholars looking into his finances. The South Sea Company printed lists of stockholders who were eligible to vote at the regular tri-annual elections of management, which were held at the beginning of 1715, 1718, 1721, and so on. There was also a similar list for the very first election held in August 1712. It was out of the tri-annual cycle because the company was set up late in 1711 and the initial management team was appointed by Queen Anne. These lists do not give exact figures for sizes of investments, but do show how many votes each stockholder had, and that provides some information about sizes of investments. The South Sea Company charter specified that an investor had to have at least 1,000 of stock to get 1 vote, at least 3,000 to get 2 votes, at least 5,000 to get 3 votes, and at least 10,000 to get the maximum allowed 4 votes. Copies of the eligible voter lists for 24 June 1712 and for 25 December of 1714, 1717, 1720, and 1723 have been preserved. Those for 1712, 1714, and 1723 are in various libraries and in the Making of the Modern World and the Eighteenth Century Collections Online databases. The list for 1717 has only been located in the University of Minnesota Library, while that for 1720 is available at Yale University, Toronto Public Library, National Library of Scotland, and Oxford University. These lists show Newton with 1 vote in 1712, 3 in 1714, 4 in 1717 and 1720, and 3 in 1723.

Collecting all the items discussed so far provides us with the following solid data about his South Sea Stock holdings:

- 24 June 1712: at least 1,000 and under 3,000
- 25 June 1713: 2,500
- 25 December 1714: at least 5,000 and under 10,000

12 Minutes of the General Court of the South Sea Company, Add MSS 25544 at the British Library.
13 [44]. These thresholds were lowered in 1733 by 6 Geo. II, c. 28, which created New South Sea Annuities.
But these are the only firm figures available at this moment for Newton’s investments in South Sea Stock. To obtain a more complete picture we have to rely on inference from information about his other investments.

We should remark that the 25 June 1721 and 25 June 1722 figures are exactly equivalent, once we take the 1/3 stock dividend of September 1721 into account. If we represent the holdings in the contemporary pounds/shillings/pence format that was used in the records of that time, Newton’s South Sea Stock holdings in mid-1721 and mid-1722 were 16275/4/9 and 21696/6/4, respectively, and the second figure is exactly 4/3 of the first. This provides more evidence that Newton did not do anything with his South Sea holdings from the end of 1720 to the middle of 1722, and that in general he seldom touched his long-term investments.

9 Newton and the East India Company

As was mentioned in Section 6 point H, there are some published claims that Newton had a large investment in the East India Company around 1723. However, they are based on a misreading of Dickson ([16], p. 279). That Dickson meant an investment by Newton in the Bank of England and not in the East India Company is confirmed by the data about Newton’s holdings of Bank Stock, Section 10, which agree in value with the figure in Dickson, and also by inspection of East India Stock records. Ledgers IOR/L/AG/14/5/1 through IOR/L/AG/14/5/5, available at the British Library, cover all holdings of that security from 1709 through 1728. They were examined and did not show any investments by Isaac Newton. (There were other Newtons who were stockholders, though.)

As an aside, the printed list of large investors on 4 April 1702 in the English Company Trading to the East-Indies includes Newton. This was the venture set up in 1698 to compete with the original East India Company, and merged with it in 1708. The ledgers in the British Library collections should enable a determination of the timing and extent of Newton’s involvement in that enterprise, but this was not done in this project, as the focus was on investments after the founding of the South Sea Company in 1711.

10 Newton and the Bank of England

The Bank of England Archive contains complete records of holdings in Bank Stock from the founding of the Bank in 1694 onwards. The stock ledgers and their indices for 1694 through
1732 were examined. (One can obtain more information about who was carrying out the actual transactions by examining the transfer books, some of which have been preserved in the Bank of England Archive. This was not done in this project.) The relevant ledgers are AC27/414 through AC27/444, and the entries for Newton are on pages AC27/418:1442, AC27/422:3182, AC27/425:4777, AC27/436:7140, and AC27/444:1105, where, as before and throughout this paper, AC27/418:1442 means page 1442 in ledger AC27/418. They show that Newton started investing in Bank Stock on 28 June 1709 by purchasing from another investor partially paid-up stock in a new subscription for enlarging the Bank’s capital. He then put in the required remaining cash. He had 1,500 Bank Stock at the end of 1711, when the South Sea Company was set up. He continued adding to his Bank holdings until they reached 6,000 stock on 14 October 1715. He then sold 4,000 of that on 11 December 1716, and the remaining 2,000 on 19 November 1719. He made nice profits on his Bank investments, but he would have done even better by putting those funds into South Sea Stock. This was true from the perspective of the end of 1719 as well as of mid-1723, provided, in the latter case, that he did not touch his investments during the Bubble year of 1720.

Table 1. Stock prices of the “moneyed companies” on selected dates.

<table>
<thead>
<tr>
<th>Date</th>
<th>Bank of England</th>
<th>East India Co.</th>
<th>South Sea Co. nominal</th>
<th>South Sea Co. adjusted for stock dividends and annuity split</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 Dec. 1711</td>
<td>108.50</td>
<td>123.00</td>
<td>75.00</td>
<td>75.00</td>
</tr>
<tr>
<td>14 Oct. 1715</td>
<td>125.25</td>
<td>134.25</td>
<td>93.75</td>
<td>93.75</td>
</tr>
<tr>
<td>11 Dec. 1716</td>
<td>135.50</td>
<td>174.00</td>
<td>103.50</td>
<td>103.50</td>
</tr>
<tr>
<td>19 Nov. 1719</td>
<td>142.85</td>
<td>196.50</td>
<td>119.25</td>
<td>119.25</td>
</tr>
<tr>
<td>31 Aug. 1723</td>
<td>121.50</td>
<td>131.50</td>
<td>104.00</td>
<td>162.07</td>
</tr>
</tbody>
</table>

Table 1 shows the market value of stock in the largest joint-stock companies on the London market on some dates. The South Sea adjusted prices include the effect of the stock dividends in June 1720, September 1721, and April 1723. The 31 Aug. 1723 price is the arithmetical average of the prices of South Sea Stock (108.625) and the South Sea Old Annuities (99.375) on that day, since the 50-50 split took place on 25 June of that year. That reflects the experience of a passive investor. No account is taken of the effect of potentially reinvesting dividends (rates of which differed slightly among these companies), or of the 10% dividend that the Bank of England paid out of its capital in mid-1719.

Table 1 shows that from the standpoint of mid-1723, South Sea Company was by far the best investment to make on any of the pre-1720 dates shown, provided the investments were made on those dates, and nothing else was done in between, especially not during the turbulent year 1720. In particular, if Newton reinvested the proceeds of his sales of Bank Stock in October 1715 and December 1716 in South Sea Stock, and left that untouched, he would have done extremely well by mid-1723, better than sticking with Bank Stock. That he did carry out such a reinvestment in South Sea Stock is plausible. It is consistent with
the data we have on his South Sea holdings, as discussed in the previous section, which appear to have been growing steadily. But all we can say for certain is that he did do well in his pre-1720 ventures in Bank of England Stock, and most likely even better in South Sea Stock.

Newton again became a stockholder in the Bank on 27 January 1724 when he acquired 11,000 stock through a new stock subscription. In 1722, as part of the final financial cleanup of the South Sea Bubble, the Bank of England agreed to effectively purchase 4,000,000 of South Sea Stock. To pay for the purchase, the Bank issued 3,400,000 of its own stock at 118, meaning that subscribers to this issue had to pay £118 for each 100 Bank Stock. This reflected the market price of Bank Stock at that time. The 11 payments of that subscription were spread out between mid-1722 and 24 February 1724, so that Newton completed paying up his allotment a month early. The details of subscriber payments are covered by Bank of England Archive files AC27/397 through AC27/403. An inspection of these documents shows that Fauquier, who was a director of the Bank in mid-1722, was given an allotment of 80,000 stock to distribute. He took 6,000 stock of that allotment for himself (AC27/400:341), and gave Newton 2,000 (AC27/400:356). Newton then bought the additional 9,000 of stock allotments from others (AC27/401:52), although surviving records do not tell us exactly when. This gave him the 11,000 stock that is cited in Dickson ([16], p. 279) and that shows up in Newton’s Bank Stock account (AC27/436:7140) in January 1724. Although we do not know when and at what prices he bought the partly-paid stock, prices of Bank Stock did not vary too much during that period, so it is likely that he had to provide around £13,000 in cash. That £13,000 is approximately the value of the precisely known reduction in his holdings of South Sea Stock between August 1722 (Section 6, point G) and June 1723 (Section 7). So this supports the theory that he had practically all his funds in South Sea Stock from the end of 1720 to late in 1722, and then diversified, by moving about half into Bank Stock.

Newton later acquired additional 1,000 Bank Stock on each of 9 October 1724, 25 February 1725, and 7 October 1726, to reach the final balance of 14,000 that was the largest part of his estate.

How well did this second move into Bank Stock after 1721 do? To be concrete, suppose that on 31 January 1723, Newton sold South Sea Stock and reinvested the proceeds in Bank Stock. Let us neglect brokerage commissions and dealers’ bid-ask spread, and assume the transaction was carried out at the final prices of that day listed in the Course of the Exchange. Bank Stock that day closed at 117, South Sea Stock at 95.125. On 31 January 1727, two months before Newton’s death, Bank Stock was at 124.25, while the combination of South Sea Stock and Old South Sea Annuities that a passive holder of 100 of that stock four years earlier would have had was worth 103.59. So the capital gain on Bank Stock over those four years was 6.2%, and on South Sea Stock 8.9%. In addition, 6% annual dividends on Bank Stock and South Sea Stock, and 5% on South Sea annuities (all on par

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14 The Bank actually paid for £200,000 per year of the government annuity the South Sea Company was receiving, which was scheduled to be reduced to £160,000 per year in mid-1727. The Bank did not receive South Sea Stock.
15 It appears to have been universal practice to offer discounts for early payments of instalments, so it was often profitable for investors to take advantage of this feature.
16 Average of 100.875 for stock and 94.125 for annuities, multiplied by 17/16 to reflect the April 1723 stock dividend.
values) during that period meant that the dividend yield on Bank Stock was about 1% per year lower (on the purchase price) than it would have been in South Sea securities. So it appears that this surmised diversification move by Newton carried a modest but not negligible cost. In purely financial terms, he would have done better by sticking with his South Sea holdings.\footnote{Investing in East India Stock would have produced results intermediate between Bank and South Sea Stock. Million Bank Stock would have produced even better capital gain, 9.9\%.}

11 Newton and the Bank Redeemables

Starting in the mid-1710s, the Bank of England began to administer some new government securities, meaning recording transfers and paying interest to individual investors. Only some of the “redeemable” or “perpetual” annuities were handled by the Bank, and, as was noted before, they are called the Bank Redeemables in this paper.\footnote{For a listing and description of the large number of Redeemables and Irredeemables, see \cite{53,54}.} Several securities were involved, all paying (through the 1720s) either 4% or 5% on the par (nominal) value. Newton’s investments in them started on a very small scale at the end of 1717, became significant only at the end of 1719, and ended in 1720. To keep things simple, they will be lumped together in this section, without listing their names and properties. This does not cause much of a problem, since from late 1719 on, all these Bank Redeemables were trading close to their nominal value, usually within ±2% of par, as there seemed to be a clear expectation that the 5% ones would be redeemed.

All of Newton’s investments in these annuities that were found are covered by Bank of England ledger entries in AC27/215:523, AC27/217:187, AC27/326:157, AC27/329:283, and AC27/341:3135. He bought 2,000 (par value) in October 1717. This was followed by two years with no activity, and then another purchase of 2,000 in November 1719, and yet another 2,000 in February 1720. Then there followed a rapid series of purchases starting on 29 April 1720, and ending 23 May 1720, totaling 26,000. The grand total, 32,000 par value (and approximately that in market value) was disposed of as follows:

- 6,000 was subscribed into South Sea Stock. In the Bank of England ledger, AC27/341:3135, the date of transfer is listed at 15 October 1720, but this was the date listed for all such transfers by all investors, presumably the date the transfers were officially effected. The first subscription for conversion of the Redeemables was opened on 14 July, with another one started on 4 August. Newton apparently submitted his holdings in the first subscription.\footnote{A transfer form, filled out and signed by Newton is in a private collection. It was shown at the 2008 exhibition, \textit{Art of the Exchange}, at the Museum of American Finance. The form was dated 13 July, and was witnessed by Richard Morgan (who had been an employee of the Mint some years earlier, and may have still been there), and by William Thompson. Presumably Newton sent somebody to the South Sea Company to execute the subscription the next day.}
- 26,000 was sold\footnote{To be precise, the 26,000 was transferred in the books of the Bank of England on that single day. They could have been sold shortly before, and they could also have involved gifts or other non-monetary transfers.} in one day, 14 June 1720, to various parties, including 3,000 to Thomas Guy and 500 to Fauquier.
The sale of his South Sea Stock that Newton directed Fauquier to carry out on 19 April, described in Section 6, point D, should have produced about £10,000. So to allow for the expenditure of about £26,000 in the month starting 29 April, Newton had to have other sources of funds, and the obvious source for them would have been further sales of South Sea Stock. This security only moved decisively above £350 around 19 May, so it is likely that the prices obtained by Newton were around that range, and if so, he must have sold around 8,000 of South Sea Stock in total in this period. Note that he had at least 10,000 of South Sea Stock at the end of 1717, so this appears very plausible. If he used the proceeds of his 14 June sales of Bank Redeemables to repurchase South Sea Stock, which at that time was around £700, he would have obtained less than half of what he appears to have sold, or under 4,000.

The most likely reading of this scanty evidence is that in late April Newton decided to realize most of the large paper profits he had in South Sea Stock. The price was around 350, and he appears to have acquired much and probably most of it at under 100, so his profits were likely over £20,000.

But as the bubble continued inflating, it appears that he panicked, and plowed all those profits back into South Sea Stock. If he paid £26,000 on 14 June for that security, which traded that day around 702, then by the end of August 1723 he would have been looking at a loss (cf. Table 1) of 77% in capital value, just about £20,000.

Newton almost surely lost proportionately less on the 6,000 of Bank Redeemables that he subscribed into South Sea Stock. If he held onto that South Sea Stock, as seems likely, then by August 1723 he owned South Sea Stock and South Sea Old Annuities worth about £3,240. So in this case the loss was ‘only’ 46%.

On 14 June, it was universally expected that an offer to convert the Redeemables into South Sea Stock would be made, but not when nor what the terms would be. (Nor, of course, what would happen afterwards, as the terms of the conversion were modified by both the South Sea stockholders and Parliament after the crash.) It appears that the haste that Newton appears to have exhibited in rushing back into the market on 14 June with the 26,000 of Redeemables as opposed to waiting, as he did with the remaining 6,000, cost him in the end about £8,000.

If the suggested reading of the Bank Redeemables evidence is correct, and Newton did rush back into South Sea Stock on 14 June and converted the remaining 6,000 in July, then his losses just on that part of his dealings, compared to sticking to the Redeemables, was by itself over £20,000. But he almost surely suffered additional losses from later transactions involving the Irredeemables and cash, discussed in the next two sections.

Newton’s transactions in the Bank Redeemables do not fit the hypothetical scenario of Hall and Tilling discussed in Section 5. Money obtained in order to pay down Mint balances would surely not have been invested in these securities. Newton’s actions through the end of May resemble those of Thomas Guy, who was steadily liquidating his South Sea Stock holdings and reinvesting the proceeds in Bank Redeemables, see Section 16.

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21 *Course of the Exchange* lists transaction prices for that day of 710, 685, and 700, while *Freke’s Prices of Stocks* gives 715, 690, and 700.

22 Table 1 and the final results of conversion in [2], vol. 2, p. 300.
The scenario in which Newton started out 1720 with 10,000 of South Sea Stock, sold 8,000 in April and May, and then repurchased 4,000 in June fits in with other parts of the picture of his activities. It would mean that Newton ended up with 6,000 of South Sea Stock out of the original 10,000. Together with the South Sea Stock that came from the conversions of the Irredeemables and the Bank Redeemables that are discussed here and in the next section, that would have produced, after the stock splits, just about the 21,700 South Sea Stock that he had in mid-1722, Section 6, point G. The information about his Bank of England Stock acquisition in Section 10, as well as about his South Sea Stock and Old South Sea Annuities holdings in Section 7, strongly supports the theory that all his investments were in South Sea Stock in mid-1722.

12 Newton and the Irredeemables

The letter of 27 July 1720 to Fauquier cited in Section 6, point E reads ([15], pp. 19–20; [33], vol. 7, p. 96):

I desire you to subscribe for me & in my name the several Annuities you have in your hands belonging to me amounting in the whole to six hundred & fifty pounds per an for which this shall be your warrant.

As de Villamil notes ([15], p. 24), “Newton’s note is very elliptical and has all the appearance of being a confirmation in writing of a previous conversation.” It was probably that, as well as additional confirmation in case any questions were raised about Fauquier’s exercising what was likely his powers of attorney over Newton’s holdings.

The language of Newton’s note makes it very clear that he was referring to Irredeemables, as those were the ones that were referred to in those days in terms of their annual yield. The phrase “several Annuities” may mean that Newton did possess more than one type (out of many) of Irredeemables, or simply that he had several separate annuities of the same type (which were far more awkward to handle than the Bank Redeemables). However, most of the market value and most of what was tendered for conversion was in the several issues of the so-called Long Annuities, and so let us assume that is what Newton owned. (That is also what de Villamil assumes [15], but he lists incorrect prices and conversion terms. Those mistakes carry over to other publications, such as [33], vol. 7, pp. 96–7.)

The first subscription of the Irredeemables opened at the end of April, with the terms announced on 19 May. Investors were given a week to decide whether to accept or not. At that time Newton was apparently still selling his South Sea Stock, so he would clearly not have been interested in participating in this conversion. But his attitude was completely different in July.

The conversion terms that were offered by the South Sea Company for Long Annuities in the second subscription in August ([2], vol. 2, p. 288) meant that for each £100 per year of Long Annuities, investors were being offered 400 of South Sea Stock and £400 of cash or South Sea bonds (which were as solid as cash, unlike the stock, but after the collapse of the Bubble did go to a deep discount for some time). So Newton most likely was being
promised 2,600 of South Sea Stock and £2,600 in cash. The market value of that package was close to the market value of his £650 per year of Long Annuities, which during that period were selling for about £35 for an annual payment of £1, so that Newton’s holdings were worth about £22,750.

In the end, as a consequence of the alteration of the conversion terms by the South Sea Company and Parliament after the crash, investors who signed up in the second subscription in August received by mid-1723 no cash or bonds, but 1545.71 South Sea Stock for every £100 per year of Long Annuities (2, vol. 2, p. 300). On 31 August 1723, that was worth £1,603, so Newton’s £650 per year of Irredeemables was worth about £10,400. Compared to simply selling his Long Annuities for cash on 27 July 1720, he thereby lost £12,350, or about 54%.

Next, for another perspective, let us consider the fact that the prices of Long Annuities in mid-1720 were elevated by the Bubble. In mid-1719, and also in mid-1721, they were selling for about £20 for each £1 per year of annuity, so Newton’s stake was worth about £13,000 at those times. From that perspective one could say he lost only £2,600, or about 20%, on this switch into South Sea Stock.

Finally, it is worth mentioning several features of this second conversion of Irredeemables that point to Newton’s eagerness to participate. Newton’s instructions to Fauquier are dated 27 July. That is the day that the South Sea directors authorized this “subscription,” to open 4 August. So, unless he was acting based on rumors of such a move to come, Newton must have learned of the decision the same day and reacted positively to the news right away.

Those who applied for conversion on 4 August or the next few days were doing so on blind faith, for the South Sea directors did not announce the terms of the conversion until 12 August. Further, when they did announce the terms, there was extensive grumbling, for two reasons (5). The terms were nowhere near as favorable to holders of Irredeemables and Redeemables as during the first conversion of April and May. Further, while investors in that first conversion had a week in which to decide whether to participate or not, this time their subscriptions were taken as binding contracts. But these facts, which might make some observers suspicious, did not cool Newton’s ardor for the prospects of the South Sea venture, as two weeks later he participated in the next and last phase of this company’s extraction of money from the public.

13 Newton and South Sea money subscriptions

The 14 June 1720 date for the sale of the bulk of Newton’s holdings of Bank Redeemables is suggestive, since the 3rd Money Subscription for South Sea Stock opened soon afterwards, on 17 June. But this is a misleading suggestion. Newton is not on the list of participants in that operation, which suggests he used the proceeds from the sale to repurchase South Sea Stock. But he did participate in a later money subscription, as shown in Section 6, point F. In this context the frequent misdating of that investment is significant. Had this investment been made in June 1720, as is sometimes stated, it would have meant much less, as it could have allowed him to change his opinion about the Bubble over the next two
months. That this investment occurred at the end of August, though, implies that Newton continued to expect a positive outcome from the Bubble until just before the crash that took place in the second half of September, even as many investors were becoming skittish. (The evidence about the handling of the Hall estate in Section 15 suggests he continued to hold onto an optimistic outlook even during the collapse.)

The South Sea Company had four so-called Money Subscriptions, in which investors were invited to purchase South Sea Stock for cash. Each involved a partial immediate down payment, with the rest spread out over extended periods of time. The first of these was opened on 14 April 1720, at a price of £300 for 100 South Sea Stock, the second at £400 on 28 April 1720, the third at £1,000 on 17 June, and the fourth one at £1,000 on 24 August. Records of investors in those subscriptions are available in Parliamentary Archives, HL/PO/JO/10/5/57 through HL/PO/JO/10/5/63. There was some fraud in those stock issues and in the associated records, but that involved bribery of highly placed persons, and so was not likely to affect records of Newton’s activities. He is not listed in the first three subscriptions, but is on the list for the 4th subscription, for 500 South Sea Stock (HL/PO/JO/10/5/63, p. 66). This meant that he was signing up to pay £5,000 for that stock, with a down payment of £1,000 on signing, and the next payment, also of £1,000, due 25 March 1721. The transfer of his investment to John Read, Section 6, point F, must refer to this action.\(^{23}\)

When did the sale to Read take place? Newton’s letter is not dated, but it is addressed to Conrade de Gols as the Treasurer of the South Sea Company. De Gols was only appointed to that post (officially “Cashier”) on 21 February 1721\(^{24}\), after the flight to the Continent a month earlier of Robert Knight, his notorious predecessor who was the central figure in the Bubble. De Gols could not have been acting in that capacity prior to his official appointment, since he was working at the Bank of England\(^{25}\). So the deal with Read must have taken place after 21 February 1721.

How much Read paid is not known. By the end of February 1721, all the discussions among management and stockholders of the South Sea Company seemed to assume that no more cash would be asked from the participants in the four money subscriptions beyond what they had already paid. But there was a vigorous debate concerning how much stock to give to those subscribers for their payments up to that point. In the end, for every £100 in cash, they received (by mid-1723) just a bit under 52 of Stock (\([2]\), p. 300), which on 31 August 1723 was worth about £54, if we apply the valuation method of Table 1. So if Newton had held onto his subscription, his £1000 would have turned into £540 (plus

\(^{23}\) The subscription and its rules were approved by the South Sea directors on 23 August, to open the next day, and it was completed on that first day, 24 August, as shown by the minutes of the Court of Directors for those days. The down payment did not have to be in cash itself, the bonds of the South Sea, East India, and Sword Blade companies, which were regarded as solid short-term instruments and usually traded slightly over par, were also accepted. The 500 South Sea Stock that Newton subscribed for was the maximum allowed, most likely in order to stoke public interest.

\(^{24}\) Minutes of the Court of Directors of the South Sea Company for that day, British Library Add MSS 25500.

\(^{25}\) Minutes of the Court of Directors of the Bank show de Gols being reappointed to his position at the Bank just below that of Cashier in the standard annual process on 7 April 1720. Minutes for 16 February 1721 show that he was given permission that day to apply for the Cashier position at the South Sea Company, and those of 23 February record acceptance of his resignation from the post at the Bank. He continued as the Cashier of the South Sea Company for over a decade.
the dividends over that period, which were a bit more than he could have obtained on secure short-term securities such as South Sea or East India bonds). He may have received that much from Read, but almost certainly not much more. On the other hand, he may very well have sold to Read for quite a bit less. Some of the proposals called for harsher treatment for participants in the money subscriptions than the ones that were imposed in the end.

So the after-the-fact analysis shows that Newton lost at least close to half and possibly a lot more of his investment in the Fourth Money Subscription. Since the money at stake was just £1,000, it did not affect his overall wealth much. Furthermore, as is shown in the next section, he was only venturing £1,000, as he was not obligated to pay any further instalments, and the next payment was not due for more than half a year.

Still, the fact that Newton was willing to put any money at all into the Fourth Money Subscription provides some insight into his thinking. It is quite possible that Newton was willing to invest much more than he did in that venture, since the amount of South Sea Stock he signed up for was the maximum allowed in that case. But what could have motivated him to invest in the first place? The Fourth Money Subscription was carried out on Wednesday, 24 August. Transfers of South Sea Stock had started up again just two days earlier, on Monday, 22 August, and so they led to the first regular transactions ‘for money’ in two months. Prices of South Sea Stock by that time were down substantially from the levels they had reached earlier that summer. Even on 4 August, when the second Irredeemables and Redeemables subscription was opened, the price (without the 10% stock dividend) was around 800, down from well over 900 at the peak. On 22 and 23 August the price was down to around 750. The real crash would come a couple of weeks later, with prices below 300 by the end of September, and many sales below 200 just before that. But the trend was already down at the end of August, and there was substantial and growing unease among the investing public. Still, there were many enthusiastic investors, as the Fourth Money Subscription was filled in a few hours, and receipts were selling at a substantial premium in the afternoon of that day. Paying 200 for the option to buy later at a price of 1,000 something that is selling at that moment for 750 is not necessarily crazy in the case of a volatile security, but it does require faith that this security has a good chance to skyrocket way past 1,000. The evidence shows that Newton did have such faith. As he was soon to learn, this faith was sadly misplaced.

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26 It is rather speculative, but the fact that Newton was second on the list of subscribers with last name starting with N may indicate that he was very eager to participate and, perhaps through an agent, showed up at South Sea House early. The entries are organized by first letter of last name, but for each letter there does not seem to be any particular order, either alphabetical or by size of subscription. So the given order may reflect the order in which entries were made in the subscription journal.

27 This was one of the regular ‘shuttings’ of the books for the preparation of dividends. During that period trades were taking place, but they were in effect futures trading, with actual transfers on the books of the company to be executed on or after 22 August, and so subject to counterparty risk as well as discounting for the value of delayed payment.

28 Course of the Exchange for that day gives prices of 800, 790, and 820, while Freke’s Prices of Stocks lists 870 and 890. While this is not stated in either publication, it is clear from comparing them that in this period the former was giving prices ex-dividend, and the latter with the stock dividend.

29 Course of the Exchange gives prices of 770 and 750 for Monday and 750 and 740 to Tuesday, while Freke’s Prices of Stocks lists 850, 815, and 820 for Monday and 820 for Tuesday, the latter again surely with the dividend.
South Sea money subscriptions: Options or futures?

The four money subscriptions of the South Sea Company were at the center of a recent spirited debate about market rationality. Richard Dale in his book [12], and then Dale, Johnson, and Tang [13] in their paper in more detail, argued that over several months in 1720, the partly-paid receipts for these subscriptions were significantly mispriced relative to each other and relative to the fully-paid South Sea Stock. Their conclusions that the market was irrational were disputed by Shea [41,42]. However, Dale et al. did not accept Shea’s arguments, and responded with an article that maintained that their earlier work was correct [14]. While there were many technical points of contention between the two sides, the heart of the issue in modern language was essentially whether the 1720 South Sea money subscriptions were futures or options; that is, whether subscribers were obliged to pay all the instalments, or whether they could walk away from their commitment at any time. In particular, once Newton paid the initial deposit of £1,000 on 24 August 1720, was he legally obligated to pay the next £1,000 that was due on 25 March 1721?

Dale et al. in effect argued that Newton was obliged to make all four additional £1,000 payments due on his subscription, while Shea maintained that Newton was not. The arguments of the two sides are long and involved, concerning the degree to which various laws and precedents applied to the South Sea money subscriptions. Neither side, however, presented any data in their papers about the actual South Sea subscriptions contracts. It turns out that copies of those contracts do exist, in Parliamentary Archives file HL/PO/JO/10/2/157. Among many items in that box, there is a folder marked both as document no. 10 and as no. 14, which contains the “preambles” to each of the four money subscriptions. These were the actual forms signed by subscribers, and they all have almost identical language about what was to happen in case of default. In case a subscriber makes some payments but defaults on the next one, to quote from the Preamble to the first subscription,

the Said first payment So paid ... shall be forfeited to the Said Governour and Company ... and the respective persons making Such Default shall be Entitled to no Greater Summ or Summs in the Said Stock (By Vertue of Such Subscription on which Such Default Shall be made) than the money which they Shall pay on or before the respective days and times for Payment thereof, as aforesaid Over and above what the Said first payment Shall amount to at the [price of South Sea Stock in that subscription].

This clearly settles the debate in favor of Shea. Investors could walk away from their subscriptions. In fact, aside from the ambiguity introduced by the phrase “no Greater Summ or Summs,” which could be interpreted as giving the South Sea Company the leeway to give less, this language clearly implies that subscribers were getting an enhanced option. If Newton, in addition to his downpayment of £1,000, also paid the next installment

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30 This set is actually referenced by Dale et al. [12, p. 241, footnote 40], using the older designation “House of Lord’s Record Office Parchment Collection, Box 157, 1720.” It is one of two large boxes full of miscellaneous documents relating to the Bubble. They were collected by Parliament during the investigations into that event. Gary Shea also found these documents, after the publication of his papers [41,42] (private communication).
of £1,000 on 25 March 1725 but then stopped, he would have been entitled to 100 of South Sea Stock.

The evidence of this paragraph does not prove that the financial markets at the time of the South Sea Bubble were rational. But the argument for irrationality based on pricing of money subscriptions that is presented by Dale [12] and Dale, Johnson, and Tang [13] is flawed, and has to be rejected.

15 Newton and the Thomas Hall estate

Very interesting light is shed on Newton and his investment activities and attitudes by the (manuscript) account book of the Thomas Hall estate. It is in the collections of King’s College at the University of Cambridge, where it is listed as Keynes Ms 148(A). It was among the large collection of papers assembled by John Conduitt, a politician and MP, who was planning to write a biography of Newton. Conduitt was Newton’s subordinate at the Mint and eventually his successor as Master, and was the husband of Newton’s half-niece, Catherine Barton/Conduitt. As is described in detail in [46], many of those papers were auctioned off in 1936 by Sotheby’s [43]. John Maynard Keynes acquired a large fraction of those papers, and bequeathed them to King’s College. The Hall account book has apparently not been investigated by any modern scholars. The only noticeable reference to it in the modern literature is in the Craig book [11]. Craig apparently did not see the account book itself, and relied solely on the description in the 1936 auction catalog [43]. In his arguments attempting to counteract the negative opinions about Newton’s financial motivations and decisions, he not only placed 27 July just four days after 23 June, but very obviously misinterpreted the nature of the securities cited in the catalog. What Craig called a sale of South Sea annuities, which he interpreted as a sign of caution about the Bubble, was actually liquidation of short-term government securities on behalf of the estate’s main beneficiary in order to participate in the Bubble.

Thomas Hall was a senior civil servant, and together with Newton is given credit for the success of the Great Recoinage of the 1690s, while the Master of the Mint at that time basically only collected the munificent rewards this operation yielded[31]. Hall was on friendly terms with Newton, served as Newton’s surety on a few occasions, and named Newton as one of the executors of his estate, which was worth about £40,000 at the time of his death in February 1718. About a third of the estate was in Bank of England Stock, a third in short-term government securities, and a third in Long Annuities. Thus, just like Newton, Hall had essentially all of this wealth in financial instruments, not the prestigious and traditional real estate, and was well-diversified, given the limited options at hand.

Newton was one of the four executors of the estate. Hopton Haynes, who was already mentioned briefly in Section [7] and comes up frequently in this section and the next one, was another one. (Fauquier was not among those four executors.) Haynes was about thirty years younger than Newton, and worked under him at the Mint. He was a protege and close friend with Newton, with whom he shared heretical views they kept secret. In the literature, Haynes is visible mainly through a few publications on theology.

[31] See [55], especially pp. 556, 558, 577, and 604 for some background information. Little information about Hall is available.
The investment decisions shown by the Hall account book reflected the thinking not just of Newton, but also of the other three executors, and even more so those of Francis Hall. Francis was the only child of Thomas Hall, and the principal beneficiary of the will. He was already an adult at the time of his father’s death. Hence it was to be expected that his wishes would be important in investment decisions, and we do find that this was so. Thus what we observe in the account book was likely influenced only lightly by Newton. Still, we do find strong evidence of Newton’s participation in the administration of the estate and can infer something about his mode of operations and his thinking. Since he was responsible (along with the other executors) for the administration of the estate to the judicial system, he surely would not have allowed investments that he regarded as irrational, even if he was willing to go along with somewhat more speculative moves than he would have approved wholeheartedly.

The Hall account book covers the three years the trust existed, from February 1718 to February 1721. It has approximately 120 pages, with 9 bearing Newton’s handwriting. Most of it consists of mundane accounting of various small debts and expenditures. Some of the small operations may represent less than the highest degree of diligence, as in slow collection of some dividends on investments held by the estate. Overall, though, one obtains the impression of careful stewardship of the estate by executors who were knowledgeable about the financial markets. For example, in July 1719, funds from maturing short-term government securities were reinvested in similar instruments that paid 4% per year. A memorandum in the book notes this was because there was “no better opportunity offering at that time, tho best endeavours were used by Sir Isaac Newton & Mr. Haynes, & Mr. Edwards consulted.”

In the first two years, there are no interesting changes in the holdings of the Hall estate, and no interesting comments. But then, close to the peak of the Bubble, a dramatic transition occurs. Recall (Section 11) that on 23 May 1720, the last of a long series of purchases by Newton of Bank Redeemables took place. It is surmised the funds for this came from liquidation of his South Sea Stock holdings, which likely took place a few days earlier. Most of Newton’s Bank Redeemables were then sold on 14 June, most likely to repurchase South Sea Stock.

A memorandum in the Hall account book states that on “21 of May 1720 at the Desire of Mr. Fra. Hall I attended Sir Isaac Newton to the South Sea House to deliver Orders for Annuities Subscribed but the proper Office being then shut up, the Orders were deliver’d on Monday 23 May ...” This was a conversion of about half of the Long Annuities in the Hall estate (£230 per year out of total of £430, so worth in the market at that time about £7,000 out of total of about £13,000) into South Sea Stock in the first subscription of the Irredeemables. Thus Newton was putting the Hall estate’s funds into South Sea Stock just about the time he was finishing liquidating most of his holdings of that security.

A few days later, on 28 May, the estate started selling off 3,000 of Bank of England Stock (out of a total of about 13,000), again with a note in the account book that this was done at the request of Francis Hall. This was clearly in preparation for further investments in

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32 The technical details of this transaction provide data about the operations of the London financial markets. The Hall account book gives dates of sales, in three equal portions, on 28 May and 1 June, and receipt of money.
South Sea Stock, which commenced on 10 June with the outright purchase of 500 of that Stock, as well as 500 of a partially-paid 1st Money Subscription allotment. Such investments continued in various forms, with the rest of the Long Annuities in the estate converted in early August, and participation in the 4th Money Subscription on 24 August, the one that Newton put his money into.

The most interesting transactions are the purchases of South Sea Stock around the middle of September. At that point this security was in a free fall, as is visible in Fig. [1]. The purchases (which involved a mixture of acquisitions for the estate and for Francis Hall or his wife, some with funds effectively borrowed from the estate) were for a total of 400 Stock, at prices of 520, 405, and 395. They could only have been motivated by deep conviction that the market’s change of heart about the South Sea Company was just a temporary irrational panic, and that there was real value in that venture.

The timing of the various early moves suggests that Newton changed his mind about the South Sea venture slowly. He appeared willing to go along with Francis Hall’s desire to invest in it just as he was completing liquidating his own holdings. He then agreed to additional moves of Hall estate funds into South Sea Stock, but took a while to put his own funds there. On the other hand, once he did commit to the Bubble, he apparently became a true believer, in that he seems to have put essentially all his money into it. There is an interesting contrast with the Hall estate. In that case, most of the Bank of England Stock holdings were left alone, and were not exchanged for South Sea Stock, although Irredeemables were. Furthermore, in June, in the Hall estate investment decisions we do find some degree of ambivalence about what the most promising investments were that we don’t see in Newton’s handling of his own money. On 13 June, one day before Newton’s sale of most of his Bank Redeemables, the Hall estate bought 500 of East India Stock, which it then sold for a tiny profit on 22 June.

There must have been extended discussions among the Hall estate executors and Francis Hall about these investments, and consultations with various advisors. It is likely that Fauquier may have been involved, although he is not mentioned in the Hall account book. Unfortunately we find only a few glimpses of such deliberations. For example, on 20 September, the estate bought 1,000 Bank of England Stock on the advice of some outsiders, and the memo in the book says that “[i]t was the Current Opinion at this time that the Bank being in a Treaty with the S. Sea Company the Bank Stock would soon rise to [300].” As it turned out, the purchase price was 220, the peak up to that point had been 270 in June.

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33 The dates for these transactions are listed as 19 and 23 September, but those must be the days the securities were transferred. Market prices, as shown in the Course of the Exchange and in Freke’s Prices ..., imply the deals were struck a few days earlier.

34 These securities were held in Haynes’ name, ledger IOR/L/AG/14/5/4:321. The dates given here are those recorded in the ledger for the actual transfers. The actual deals must have taken place a few days earlier, based on comparison of prices realized with those in the market. The Hall account book gives the date of sale as 22 June in one place and 23 June in another.
of that year, and the market price basically went down from that point on, and did not recover to the 220 level until the beginning of the 19th century.

There are some even more illuminating instances in the Hall account book of how Newton and his co-executors, as well as Francis Hall, operated. At the end of November 1720, a payment of £150 on the 1st Money Subscription (which had been bought for the estate in June) was due. By the rules of those subscriptions, the South Sea Company was obliged to accept its own bonds at par. So the executors bought such bonds from a broker for £136.53. In retrospect these bonds were worth their par value, as they were backed by very solid collateral, the guaranteed flow of interest payments from the government. But this was clearly not apparent to many investors, as there were no reliable accounts of the South Sea Company, politics was clearly going to play a major role in the financial affairs of the company, and there was a substantial prospect that everything might be tied up in courts for years. For Newton and his fellow executors, though, the decision was simpler, it was either to pay £150 directly to the South Sea Company, or £136.53 to a broker, and they took the obvious route. They would have done even better had they shifted much of the estate’s holdings into those bonds. A few investors, such as Thomas Guy, discussed in the next section, did that, and reaped the rewards. Newton and his colleagues did not do it. Further, their hesitation in this situation is illustrated well by a note that “upon a discourse that the Payments made would be forfeited if the Subsequent payments were not duly performed: Mr Hall & Mr Haynes were at the So Sea House to make the 4th Payment but forbore it because of the Unsettled State of the affairs of the South Sea Company.” This shows they were sufficiently uncertain of what to do so they backed out at the last moment. It also shows they did not understand fully the features of the South Sea Money Subscriptions. As is discussed in Section 14, failing to pay that instalment would almost surely not have resulted in a complete forfeiture of the investment.

There are some other gleanings of the investment style of Newton and his colleagues that we can gather from the Hall book. They shared many of what are nowadays called behavioral economics traits common to investors. For example, there is a 25 October 1720 note about a sale of 1,000 of Bank of England Stock, that it “was transacted to prevent a Fall below the Rate at which it was purchased it being now a Sinking Market.” This was the 1,000 of Bank Stock that was bought a year earlier, and was held in a joint Newton–Haynes account that was mentioned in Section 5, ledgers AC27/427:5950 and AC27/436:7120. Mentally it was being treated separately from the much larger holding of Bank Stock that was left from the original Thomas Hall investments. One would think a rational move, if a continuing price decline was expected, would have been applied to a substantial part of that larger account as well.

Since Newton was just one executor, and the main moves in the Hall estate were pushed by Francis Hall, the main beneficiary, we can only make some inferences about Newton’s opinions, behavior, and general investment abilities. In hindsight, he made the correct early evaluation, that the South Sea venture was going to collapse. But then, very likely as a result of discussions, in particular with Francis Hall and the other executors on the Hall estate, he changed his mind, and became an ardent believer, more ardent that those around him. He did not show any unusual investment acumen, not like that of Thomas Guy, say.
16 Dr. John Francis Fauquier, Thomas Guy, and other investors

The vast majority of British investors did take part in the Bubble by converting their Irredeemables, Redeemables, as well as cash, into South Sea Stock. But there was a substantial minority who simply sat out the whole event, and thus did very well. Another substantial minority either sold out their South Sea Stock holdings, or bought and then sold, in a ‘rational bubble’ pattern of behavior. An instance that is well documented in the existing scholarly literature is that of the Canton of Berne. The published account of that case appears to imply that the Berne government did not have any firm view of how the Bubble would develop, and were simply being cautious [1]. The Hoare Bank, on the other hand, appears to be a case of an organization that understood the South Sea Bubble was unstable, but did not predict precisely when it would burst, and therefore carefully timed its transactions to minimize risks and produce large profits [50, 51]. An even better example is that of Lord Londonderry. The fascinating account of his financial dealings in the Neal book *I Am Not Master of Events* [32] portrays an expert trader with an excellent sense for market psychology who managed to successively ride first John Law’s Mississippi scheme bubble in Paris, then the South Sea Bubble in London, and then the Dutch bubble that followed. Not the least fascinating aspect of the Londonderry story is that he fell into financial difficulties, in spite of good market timing, through failures of his counterparties. Perhaps even more interesting is the fact that while he was acting to cash in his gains in the South Sea Bubble, his family forced him, as their financial agent, to invest their funds in South Sea Stock. (They then proceeded to blame him for the losses after the crash!) So apparently he was not able to convince his relatives that his views on the dim prospects of the South Sea Company were correct.

We next consider in some detail two large investors. One was Dr. John Francis Fauquier, who was close to Newton. The other was Thomas Guy, who was probably totally unknown to him (although, as was mentioned in Section [11] they were on opposite ends of a transaction in June 1720, most likely carried out through brokers, which turned out well for Guy and poorly for Newton). Very little is known about Fauquier (whose name was sometimes written Fauquiere, Fouquier, or Ffouquier, in those days when spelling was very variable). His son Francis (1703–1768) is far better known, with an entry in [29], based largely on his career as a British colonial administrator in North America. The father was already a deputy to the Master of the Mint when Newton was appointed Warden, and Newton retained him in that post when he became Master [11]. Fauquier served in that position until his death in September 1726, half a year before Newton passed away. It is rather puzzling that Fauquier would continue in that post, as it was not very lucrative, and he was one of the many French Huguenots who attained prominence and wealth in English commerce and finance around 1700. He was a director of the Bank of England for most of the years between 1716 and his death [33]. He also engaged in substantial financial operations, far more extensive than those of Newton. Yet he was not only Newton’s poorly paid deputy at the Mint, but apparently also his broker, and his surety (providing a guarantee against financial misconduct, required of all officials in similar positions) ([33], vol. 4, p. 392).

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35 However, he was never Governor, as claimed in some sources, e.g. [55], p. 578.
Fauquier shows up in many stockholding records. He had at least 5,000 South Sea Stock already in mid-1712, and at least 10,000 at the end of 1714, 1717, 1720, and 1723. On 24 June 1723, he had 51,480 South Sea Stock (AC27/6441:272), and on 29 September 1725, he had 20,000 Bank of England Stock (AC27/435:6528). Newton did not simply follow what Fauquier was doing, as their investments did have noticeable differences. For example, Fauquier had substantial investments in East India Stock in this period, whereas Newton had none. But Fauquier did appear to share Newton’s enthusiasm for the South Sea Company at the height of the Bubble, as we find him subscribing much of his holdings of Bank Redeemables, as in the 10,600 par value in AC27/328:19. We also find him converting the 500 of Bank Redeemables that Newton sold to him on 14 June into South Sea Stock. In that case he seemed more cautious than Newton, and was rewarded for this caution, as by waiting to convert he did better than he would have by going into the market to buy, as Newton apparently did. Overall, his enthusiasm for South Sea was more restrained than Newton’s, as he did not put all his funds into South Sea Stock, and instead kept much of his Bank of England and East India investments. On the other hand, he apparently did not share Newton misgivings about the South Sea project in April and May, as no sign had yet been found of his liquidating his South Sea Stock holdings during that period.

Much more can undoubtedly be learned about Fauquier, and possibly thereby also about Newton, by more intensive study of Fauquier’s financial records. In addition to his accounts in various government securities and in Bank of England, East India Company, and South Sea Company, he had a regular drawing account at the Bank, with complete records available. That account shows numerous transactions, including some with Newton.

Thomas Guy is widely cited as one of the great winners out of the South Sea Bubble. The most detailed report on his financial dealings at that time that has been published appears to be that in Cameron’s book. It was based on inspection of the surviving personal papers of Guy, which used to be in the archives of Guy’s Hospital, and are now at London Metropolitan Archives. However, Cameron’s investigation was not very deep, since Guy’s financial dealings in 1720 were only a very small part of the picture he was drawing. A more detailed analysis of Guy’s investment performance will be prepared and published elsewhere, while this section presents just a brief sketch.

The widely cited story of Guy selling out his substantial South Sea Stock holdings as the Bubble was inflating is correct. At the start of 1720, he had 54,040 of this Stock, acquired over many years, starting at the beginning of the South Sea Company’s existence. It appears that he paid a little under par on average (with the highest price paid by him that has been found in the records just under 119, and the lowest 75). His last purchase before the Bubble was in June 1719, at 116.5. He started liquidating this entire position on 22 April 1720 at a price of 340. This was exactly three days after Newton instructed Fauquier to sell part of his holdings. Apparently both decided at about the same time this price was not sustainable, although it had been at that level for about a month, as is visible in Fig. Guy substantially completed his sales on 10 June at a price of 600, with a last

36 Lists of South Sea voters, described in Section 8, such as 14.
37 Newton’s transfer to Fauquier is in AC27/326:157, and Fauquier’s conversion is in AC27/326:229.
38 It appears that almost files relevant to Guy’s activities in the South Sea Bubble are listed under H09/GY. The figures cited in this section are taken from files H09/GY/D/005/001, H09/GY/E88, and H09/GY/T3.
clean-up sale of 40 Stock on 14 June. That was the day that Newton carried out his large sale of Bank Redeemables, surmised to be in order to repurchase South Sea Stock.

Guy’s sales brought him £226,638, at an average price of 419. This produced a capital gain of about £175,000. For comparison, at his death at the end of 1724, he was worth about £300,000, of which about £100,000 was distributed in bequests to various people, and £200,000 went to establish Guy’s Hospital and further not just patient care but physician education and medical research.

So far this story is basically what has been published already. But it turns out there are some angles to it that have not been explored before. After selling out his South Sea Stock in June, Guy did participate in a large conversion of Irredeemables (£725 per year, with market value of about £25,000). Did he change his mind about the prospects for the South Sea Company, the way Newton did? Perhaps, but it’s more likely he was trying to limit his losses from his short sales. He not only sold all of his South Sea Stock, but in effect made some short sales by selling call options. For one of those transactions, the archives have a letter from William Bell, dated 20 August, demanding that Guy fulfill the contract of 19 May, for delivery of 3,000 South Sea Stock at 400, at a time when the market price was around 800 (including the 10% mid-summer stock dividend). Presumably the option (“refusal” in the language of the time) contract called for delivery on 22 August, when the transfer books reopened. Had Guy sold the option with an expiration a month later, he would have been a clear winner, as the price was far below 400 by then. As it is, he likely suffered twice. When he realized prices were not going down as quickly as he anticipated, be probably decided to convert his Irredeemables in order to have South Sea Stock to deliver. However, the South Sea Company was slow to carry out the conversions, so Guy presumably had to buy that stock in the market, and then in addition take the loss entailed in the conversion of the Irredeemables. It appears that he probably lost around £40,000 on these short sales, the one to William Bell and others.

Overall, though, these were moderate losses, when compared to Guy’s resources and the gains from his simple sales of South Sea Stock. He did not go overboard with his short sales. And he was not discouraged by those losses. It appears that he did buy some partially-paid 1st Money Subscription allotments at the end of 1720, and then proceeded on a sustained run of purchases at the end of 1721. Just before the mid-1723 split, he had 34,440 South Sea Stock. He was also a heavy buyer of South Sea bonds in late 1720, when they were at the heavy discount mentioned in Section 15.

Unlike Newton, Guy did not succumb to the groupthink of the South Sea scheme. It appears that from the beginning he had a skeptical view of the Bubble, and managed to exploit it with only minor stumbles.

17 Conclusions

This paper provides new evidence that substantiates the popular story about Newton initially being skeptical about the South Sea Bubble but then embracing it enthusiastically. The resulting picture is still not complete, but it is much more detailed than before and it helps illuminate that very popular investment anecdote. But it is more than just another
example of a genius succumbing to the prevailing groupthink of an investment mania. It suggests further directions for research. The detailed records of investments in various securities can be used to study the dynamics of bubbles. Some studies of the social, ethnic, and religious backgrounds of investors in various securities were already carried out by Dickson in his seminal work [16]. Other studies have been carried out since, for example on gender effects, cf. [7, 25, 26, 27]. What seems worthwhile is to apply the rapidly improving tools of social network analysis to the study of the South Sea Bubble (as well as other bubbles). This paper showed some patterns of financial transactions by Newton that indicate his changing evaluations of the prospects of the South Sea Company. But so far he is the only case that has been found of a substantial investor who took profits on the early rise of the Bubble, but then jumped back in. Other investors, such as Fauquier and Guy, show different patterns, usually either consistently believing the South Sea story, or consistently being negative. By digitizing more records, we could study the variety and distribution of types of behavior. Ideally this could then be applied to study diffusion of information. Clearly wildly different views on the Bubble co-existed, corresponding, as is increasingly being discussed in today’s post-truth world, to different groups evaluating the same facts in diametrically opposed ways. Such studies would hopefully lead to more insights into the dynamics of bubbles.

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(http://www.dtc.umn.edu/~odlyzko/doc/mania-ack.html)

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