

Newton's financial misadventures in the South Sea Bubble

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Abstract. A very popular investment anecdote relates how Isaac Newton, after cashing in 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 items of hard evidence, some of which are consistently misquoted and misinterpreted. A superficially plausible contrarian 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 understates 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 market valuations went to what seemed to him unjustified levels. However, 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 “[he could] 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. It 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 [29]. Newton was a member of the British governing elite. He took part in the debates over the major changes in monetary policy that were carried out in that period, one effect of which was to initiate the move from silver to gold as the standard, a move that was later followed by most of the world. His influence there is not clear, though, and generally, he did not contribute any striking insights into monetary or general economic thinking [23,43]. Aside from the great scientific reputation he enjoyed during his life, he was paid well for his duties at the Mint. In spite of any losses in the South Sea Bubble, he 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; [25], p. 41; [52], p. 119. However, deeper investigators of Newton's life and career, and even some popular writers about Newton, do emphasize that this tale is based on extremely limited information about his investments, cf. [10,11,22,56]. The entirety of the evidence available until now in the literature is described in Section 7. It 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. 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 have led 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, 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" [24]. 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 3, he did not provide any substantiation for this claim. 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” ([56], 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 today¹. 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. 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 8. Hence we have to rely on what little remains.

Fortunately, there are complete records of Newton’s investments in some other securities. They are explored here for the first time. 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. Taken together, these items provide a safer basis of judging what he did than the few episodic items that have been available until now.

Further 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. They provide valuable information about the investment knowledge, thinking, and actions of Newton and the people around him at the time of the Bubble.

¹ These are very rough figures that should not be taken too literally. Some published cost of living estimates lead to figures lower by a factor of five. On the other hand, comparisons based on GDP or national budgets lead to higher values.

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. However, it is probably much more than that. Larry Neal ([32], 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. Yet future generations will likely also laugh at most of the pre-2008 pronouncements. Regulators and business leaders of that time, as well as finance and economics PhDs, extolled the stability-promoting wonders of CDO-squareds and the nirvana of the Great Moderation.

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.

The next section presents a 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.

Section 3 covers briefly the investments of the Thomas Hall estate. Newton was one of the executors, and the story of that estate yields illuminating hints about Newton's views and actions. In particular, it shows that Newton was very familiar with the London financial markets and carried out some transactions in person. This material provides some of the strongest evidence that Newton's financial losses in the South Sea Bubble did not come from leaving investment decisions to some advisor. Newton was very active himself on the investment scene, and bears personal responsibility for his losses

Section 4 is devoted to investments of Dr. John Francis Fauquier and Thomas Guy. Fauquier was a major financier and close associate of Newton. The contrasts and similarities that come out of comparing his investments to Newton's are intriguing. Thomas Guy is known for making a fortune by selling South Sea holdings. 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.

The following sections start by sketching the basic information about the South Sea Company and the London financial scene early in the 18th century. Then they discuss what has been known about Newton's investments, and what has been uncovered recently. 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.

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 of Newton's misadventures

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 a variety of 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. On the other hand it also means that the few episodic data points 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. (What the word 'stock' means is explained in Section 5.) 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 6.

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. 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 three 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 other ones between them that are not shown in the figure, are discussed in Section 3. 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 these purchases. The first one preceded

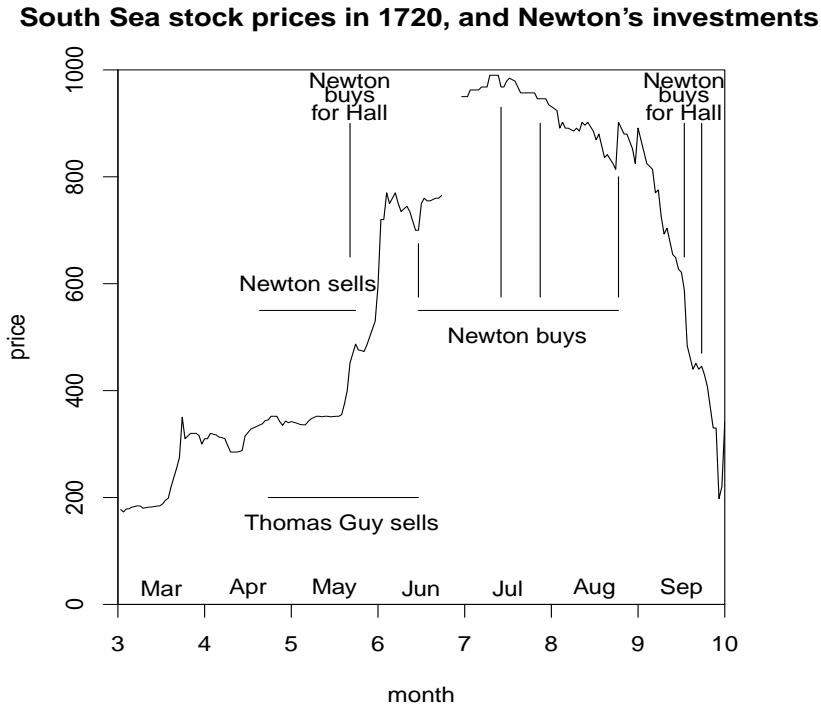


Fig. 1. South Sea stock prices and investments by Newton and Thomas Guy during the Bubble of 1720. Source for prices: *Course of the Exchange* (adjusted for stock dividend). Sources for investment dates: records at the Bank of England, London Metropolitan Archives, and King’s College Cambridge. The vertical lines for Newton’s purchases denote some of the purchases (the first one surmised, others firmly documented). The horizontal lines denotes periods of sales, estimated for Newton and precise for Guy. The three lines marked “Newton buys for Hall” represent the earliest and last purchases in a series for an estate, where Newton was just one of the executors. 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.

his own repurchases. The last two show 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 that Newton owned at various times. 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 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-1721, Newton’s long-term security holdings

consisted almost entirely of about 16,300 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-1722. We can trace a path that led from this to the entirety of the long-term holdings in his estate at death. This inference that Newton’s possessions in mid-1721 were almost entirely in South Sea Stock then limits, given what we know about his operations in 1720, what he could have done that year, or even before.

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-1721, it appears that his entire investment consisted of about 16,300 South Sea Stock mentioned above, with market value of £20,000. This indicates a loss of about £12,000, and likely somewhat more, around £14,000, 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.)

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

Prices in pounds sterling for 100 stock, taken from *Course of the Exchange*.

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

It is easy to imagine 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. However, 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 various government securities he owned 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. He would also have done quite well had he put all his funds into South Sea Stock in June 1719, say, and not touched them. As is shown in Table 1, that security was actually very profitable for those who did nothing during the Bubble year 1720. This is explained in later sections.

3 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), the result of a bequest by John Maynard Keynes². 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 [44]. In his arguments attempting to counteract the widely held 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 Bubble³.

Thomas Hall was a senior civil servant, and together with Newton is given credit for the successful execution of the Great Recoinage of the 1690s. 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. (Descriptions of these and other securities, and of the ledgers that are cited here, are presented later, in Section 5 and Section 8.)

Newton was one of the four executors of the estate. Hopton Haynes was another, but Fauquier was not among the four.

The investment decisions shown by the Hall account book reflected the thinking of all the executors, and also of Francis Hall. Francis was the only child of Thomas Hall, and the principal beneficiary of the will. Since he was already an adult at the time of his father's death, 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 partially 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 embraced personally.

² For a history of this and other items in the bequest, see [44,47].

³ Other mistakes in Craig's work are detailed in [4].

The Hall account book covers the three years the trust existed, from February 1718 to February 1721. 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 were no interesting changes in the holdings of the Hall estate, and no interesting comments. Then, close to the peak of the Bubble, a dramatic transition occurred. It is shown in Section 11 that on 23 May 1720, the last of a long series of purchases by Newton of what this paper calls Bank Redeemables took place. (They are described later, along with some of the other securities of that period.) 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 estate⁴ 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 Hall⁵. This was clearly in preparation for further investments in South Sea Stock, which commenced on 10 June.

The most interesting transactions are the final 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 395⁶. They could only have been motivated

⁴ £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.

⁵ 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 for them on 2 June, which is also the date all three transfers were carried out in the Bank of England ledger AC27/426:5277. This, as well as some of the other entries in the estate book, show that it was common for deals to be struck one day, and then finalized and money transferred a day or even several days later. Hence the dates given for Newton’s transactions, as well as others, may not be exact, but to keep the presentation simple this will be largely ignored in this paper.

⁶ 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.

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 involving either the Hall estate or Newton's own funds suggests that Newton changed his mind slowly about the South Sea venture. He appeared willing to go along with Francis Hall's desire to invest in it just as he was completing the liquidation of 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. They were not exchanged for South Sea Stock, although all Irredeemables were. Furthermore, in the Hall estate investment decisions in June, 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 June⁷. There is no sign of Newton investing his money in anything other than South Sea Stock in that period. We do have definitive evidence that he did not buy Bank Stock or East India Stock.

There must have been extended discussions among the Hall estate executors and Francis Hall about these investments, and consultations with various advisors. Unfortunately we find only a few glimpses of such deliberations, and only from later periods, after the collapse of the Bubble. Those glimpses do provide some insight into the thinking of the executors and Francis Hall. 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]." This "Current Opinion" turned out to be wrong. The purchase price was 220, and the market for that security basically went down from that point on.

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 in payments of subscription instalments. 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. This was clearly not apparent to many investors, though. This can be explained by the absence of reliable accounts of the South Sea Company, clear signs that Parliamentary politics was going to play a major role in the financial affairs of the company, and 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

⁷ These securities were held in Haynes' name, East India Stock ledger IOR/L/AG/14/5/4:321, available at the British Library. 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.

to pay £150 directly to the South Sea Company, or £136.53 to a broker, and they took the economically rational route. This incident shows they were aware of market conditions, and were willing to exploit market inefficiencies in the short run. 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. Section 14 shows that failing to pay that instalment should have been seen as unlikely to result in a complete forfeiture of the investment⁸.

4 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. A substantial minority, on the other hand, 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 of an investor that did well in the Bubble and whose behavior is well documented in the existing scholarly literature is 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 have understood the South Sea Bubble was unstable, but did not predict precisely when it would burst. It carefully timed its transactions to control risks and managed to produce large profits [51,52]. 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* [33] portrays an expert trader with an excellent sense for market psychology.

We next consider in some detail two large investors. One was Dr. John Francis Fauquier, who was close to Newton. He 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. He was a director of the Bank of England for most of the years between 1716 and his death⁹. 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, a role that Thomas Hall also played on some occasions) ([34], vol. 4, p. 392).

⁸ The way Parliament decided later, it did not.

⁹ However, he was never Governor, as claimed in some sources, e.g. [56], p. 578. In addition, he was not among the Bank directors at the height of the Bubble, May to September 1720.

Fauquier shows up in many stockholding records. Given his wealth, prominence, level of financial activity, and friendship with Newton, it would not be surprising if Newton left all his funds in Fauquier's care. However, that was clearly not the case. The section on the Hall estate shows that Newton was personally involved in selecting and carrying out some transactions. Further, Newton did not simply imitate 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. Still, Fauquier did appear to share Newton's enthusiasm for the South Sea Company at the height of the Bubble. We find him subscribing much of his holdings of Bank Redeemables, as in the 10,600 par value in AC27/328:19, as well as the 500 that Newton sold to him on 14 June, which are described in Section 11. In that last case he seemed more cautious than Newton, and was rewarded for this caution. 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.

Thomas Guy is widely cited as one of the great winners out of the South Sea Bubble. The most detailed previously published report on his financial dealings at that time is in Cameron's book [6]. It was based on inspection of the surviving personal papers of Guy. They used to be in the archives of Guy's Hospital, and are now in London Metropolitan Archives¹⁰. However, Cameron's investigation was not very deep, since Guy's financial dealings in 1720 were peripheral to his main object. A complete description of Guy's investment performance requires further analysis, and this section presents only a brief and preliminary 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.

Guy 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. This coincidence in dates may be purely accidental, but it may also reflect something they both learned in that period. South Sea Stock price made its first dramatic jump about a month before, and had been stable over that month, as is visible in Fig. 1. Guy substantially completed his sales on 10 June at a price of 600. There was a last 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

¹⁰ It appears that almost files relevant to Guy's activities in the South Sea Bubble are listed at the London Metropolitan Archives under H09/GY. The figures cited in this section are taken primarily from files H09/GY/D/005/001, H09/GY/E88, and H09/GY/T3.

about £300,000, of which about £100,000 was distributed in bequests to various people, and £200,000 went to establish Guy's Hospital.

So far this story is basically what has been published already, with just a little more detail. Here we add an interesting and previously unknown twist to the story. After selling out his South Sea Stock by June, Guy did participate in a large conversion of Irredeemables in August (£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 the South Sea Stock in his account, but in effect made some short sales by selling call options. He likely suffered twice as a result of those transactions. When he realized prices were not going down as quickly as he anticipated, he 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.

Overall, though, these were moderate losses, when compared to Guy's resources and the gains from his simple sales of South Sea Stock. He continued to invest in that company. 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 3.

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.

5 South Sea Bubble details

This section presents some of the details relevant to the South Sea Bubble that are needed to fully understand Newton's investment activities. The South Sea affair as a whole is involved, so most of the background information has to be omitted. For more detail, see the numerous books on this topic, such as [2,8,12,16,38].

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 public¹¹. 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 about market efficiency and cultural factors in finance [35]. Just before the South Sea

¹¹ For more precise accounting, see [16], around p. 93.

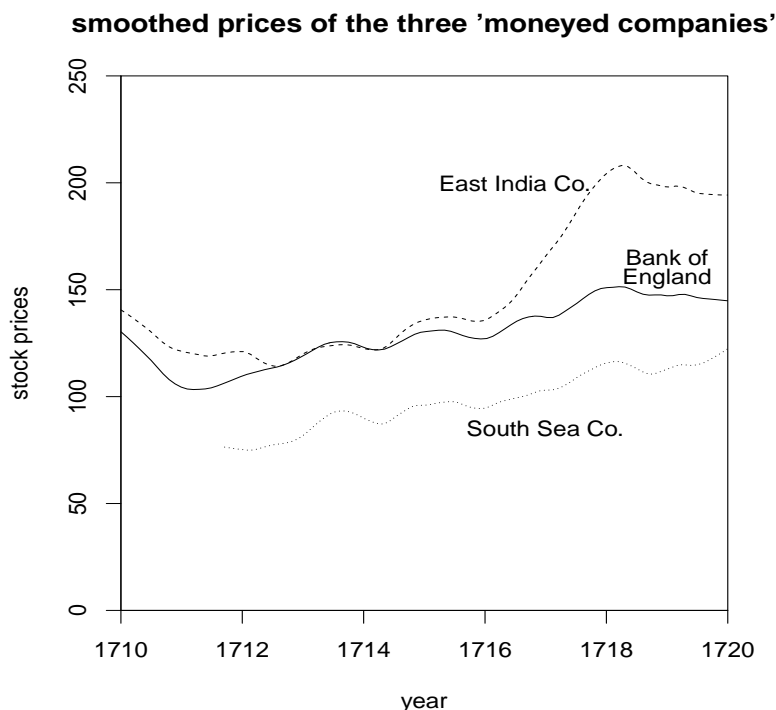


Fig. 2. Stock prices of the three dominant joint-stock companies on the London market, from start of 1710 to end of 1719. The South Sea Company stock started trading in late 1711. Source: *Course of the Exchange*, prices smoothed with the lowess function in the R statistical analysis package.

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.

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.

The three largest joint-stock companies on the London market were the Bank of England, the East India Company, and the South Sea Company. Equity investors in them held what was called ‘stock.’ 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.

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 small, cf. [17,37], although prospects of their flowering and producing bountiful profits were key in making the Bubble plausible. This enterprise was thus basically just passing on the funds it was receiving from the government to its stockholders.

The South Sea Company started out as an innovative experiment, so one could argue that the early investors in it, such as Newton, Guy, and Fauquier, were adventurous. It quickly turned out to be a success, and was very solid until the Bubble of 1720. As is shown by Fig. 2, investing in South Sea Stock was noticeably better than in Bank of England Stock in the 1710s, although not as lucrative as in 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 9.

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 roughly 120 in mid-1721, just about its price at the end of 1719.

The prices of South Sea Stock in Fig. 1 are adjusted for the mid-year 10% stock dividend, which is discussed in Section 8. 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 onwards.

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 1¹².

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

¹² 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.

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, and a new year started on 25 March. 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.

6 Newton and his finances

There is extensive data about Newton’s income, first from Cambridge University, and then from the Mint, cf. [15,56]. 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 ([56], pp. 606–607). In addition, dividends on his investments were likely around £1,500 per year. Much less is known of what he did with his money. 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” ([56], p. 580). He also made many gifts, to the Royal Society as well as to relatives. He certainly had money to spare, and the general pattern we can see among his investments 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. Still, 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 inspected survive in the parchment rolls at the National Archives [16], and might clarify some of the issues left open by this paper.

Records of some other joint-stock companies from that period that Newton might have invested in do exist, and might show some investments by him. That is the case, for example, for the Million Bank, which by 1720 was the equivalent of a closed-end 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 ([50], 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.

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 [26,27,28], 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 mentioned in Section 3. 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 level¹³.

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* ([34], vol. 7, pp. 96–7) are incorrect in some of their commentary on Newton's 27 July 1720 letter. This is discussed in Section 7, 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 Newton often held large amounts of such funds¹⁴.

Investing running balances of public funds in long-term securities would generally be considered not just risky, but foolhardy. However, manias often lure people into investments that look very foolish afterwards. A notorious South Sea Bubble case involved masters of Chancery, who invested large sums of this nature in South Sea Stock, resulting in huge losses [53].

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. 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 raised the possibility that some of the funds in the 'sworn estate' discovered by de Villamil might have belonged to the Mint. However, we do have records of the disposition of two of the only three significant components of this 'sworn estate,' those of Bank Stock and South Sea Old Annuities¹⁵. They were divided among Newton's 8 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.'

¹³ 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 3.

¹⁴ All data about Mint funds that is cited here is drawn from the Hall and Tilling commentary in [34], vol. 7, pp. 96–7.

¹⁵ In ledgers AC27/6447:169 and AC27/444:1105 in the Bank of England Archive, reference explained in Section 8. These records help clarify the questions about the fate of Newton's estate that are presented as somewhat doubtful in ([56], pp. 871–72).

7 Previously known 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” ([48], 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.

This “madness of the people” quote, the earliest that has been found, was published in 1820. It can be traced further back, though. That book was based on notes collected by the literary scholar Joseph Spence, who lived from 1699 to 1768 [30], 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 scholars¹⁶. They are Spence’s “chief claim to fame,” and “[reflect Spence’s nature]: self-effacing, conscientious, discriminating, knowledgeable, and kindly” [30].

The latest edition of Spence’s *Anecdotes* [49] identifies Spence’s informant “Lord Radnor” as John Robartes, the fourth Earl or 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 [30], 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 Seward¹⁷. 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

¹⁶ An extensive discussion of the importance and reliability of Spence’s accounts is presented by Osborn, the editor of [49], in that version of Spence’s *Anecdotes*.

¹⁷ *The European Magazine*, May 1791, p. 340. Seward published many of his anecdotes in various serials before publishing them in book format.

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 [30]. So it is likely that sometime around 1796, Seward received some additional information to supplement the initial item 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 ([34], 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 [34], 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 ([34], 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. [31], 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 ([34], 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., [56], 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 ([34], 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. [56], p. 862) that Newton held 11,000 of East India Stock at that time. However, this is a mistake. East India Stock ledgers available in the British Library show he did not own any of that security between 1709 and his death.
- 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)¹⁸.

¹⁸ 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.

8 South Sea records and South Sea Stock splits

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. Eventually it did dwindle into insignificance, and was dissolved in the 1850s. 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). They are now at the British Library.

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 Annuities¹⁹. These annuities became the direct obligation of the British government, with the South Sea Company just the administrator. Upon dissolution of this enterprise in the 1850s, South Sea Stock ledgers were retained by the trustees, and presumably eventually discarded. On the other hand, the ledgers of all 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. This is the only known complete record of the ownership of that security aside from a similar record arising from the split that created the New South Sea Annuities in 1733. 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. 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 Annuities. This same ledger shows that Newton did not touch his Old Annuities holdings until his death, aside from collecting dividends. 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 that he did not touch his South Sea Stock during the intervening period.

We can make some further deductions about Newton'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 securities²⁰.

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 660²¹. Next, in September 1721, as part of the mop-up after the Bubble,

¹⁹ They were called just South Sea Annuities then. However, in 1733, South Sea Stock was split further with the creation of the New South Sea Annuities, so in this paper the term that only came into use a decade later is used for consistency with other literature.

²⁰ Information about the various stock dividends is presented in ([2], vol. 2, p. 301), for example.

²¹ The skipped mid-1720 cash dividend was largely made up by a larger than normal 5% cash dividend at year-end 1720.

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.

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 20 or 100²².

9 Additional information about Newton's South Sea holdings

In 2017, another financial directive from Newton surfaced at an auction [3]. 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 solid 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 seems 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 over a year later, at the end of September 1722, and bearing 5% interest²³. That was a very good interest rate for that time. Hence there was no need to hurry to collect the documents. In contrast, the instructions in Section 7, 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 cited before. Before each tri-annual election of management, the South Sea Company printed lists of stockholders who were eligible to vote. These lists do not give exact figures for sizes of investments, but do show how many votes each stockholder had. 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 votes²⁴. Copies of the eligible

²² Minutes of the General Court of the South Sea Company, 29 March 1723, British Library Add MS 25544.

²³ Minutes of the General Court of the South Sea Company, Add MSS 25544 at the British Library.

²⁴ [45].

voter lists for the initial election, dated 24 June 1712 [46] and those dated 25 December of 1714, 1717, 1720, and 1723 have been preserved. Those for 1712, 1714, and 1723 are in various libraries and in several online databases. The list for 1717 has only been located in the University of Minnesota Library, while that for 1720 is available in several libraries. 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
- 25 December 1717: at least 10,000
- 19 April 1720: over 3,000
- 25 December 1720: at least 10,000
- 25 June 1721: 16,275.24
- 25 June 1722: 21,696.32
- 24 June 1723: 10,000
- 25 June 1723: 5,000
- 25 December 1723: at least 5,000 and under 10,000
- 20 March 1727: 5,000

These are the only firm figures available at this moment for Newton's investments in South Sea Stock.

We should remark that the 25 June 1721 and 25 June 1722 figures are exactly equivalent, if we express them in the original pounds/shillings/pence format and take the 1/3 stock dividend of September 1721 into account. 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.

10 Newton and the Bank of England

The Bank of England Archive contains complete records of holdings in Bank Stock. The stock ledgers and their indices were examined in search for Newton's holdings²⁵. The ledger pages that are relevant are 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 in 1709. 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 right at the beginning. It is plausible that the proceeds from his Bank Stock sales were invested in South Sea Stock.

²⁵ One might be able to obtain some additional incidental information by examining the transfer books. This was not done.

That could help account for the jump we observe in his holdings of South Sea Stock from year-end 1714 to year-end 1717, and would suggest he had at least 12,000 of South Sea Stock at the start of 1720.

Table 1 shows the market price 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. All we can say for certain, though, is that he did do well in his pre-1720 ventures in Bank of England Stock. He most likely did 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 Stock²⁶. To pay for the purchase, the Bank held a subscription for an addition to its stock. 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 early²⁷. The details of the subscriptions 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

²⁶ The Bank actually paid for part of the government annuity the South Sea Company was receiving. It did not receive South Sea Stock.

²⁷ 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. Thomas Guy participated in the same subscription, and completed paying his money a year early, on 11 February 1723.

South Sea Stock between August 1722 (Section 7, point G) and June 1723 (Section 8). 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 three occasions, in October 1724, February 1725, and October 1726. This brought him to the final balance of 14,000 that was the largest part of his estate.

This surmised diversification move by Newton carried a modest but not negligible cost. Comparing prices between January 1723 and January 1727 shows that South Sea Stock (assuming it was split in the natural passive way in June 1723) performed slightly better than Bank Stock.

11 Newton and the Bank Redeemables

There were several kinds of Bank Redeemables in 1720, all paying either 4% or 5% on the par (nominal) value²⁸. 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 properties²⁹. 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 $\pm 2\%$ of par, as there seemed to be a clear expectation that the 5% ones would be redeemed.

Newton bought 2,000 (par value) of Bank Redeemables 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. The first of these was recorded on 3 November 1719, so was likely not financed by the proceeds of the sale of 2,000 of Bank Stock on 19 November (which would have produced a larger sum, over £2,800, as opposed to about £2,000 needed to pay for the Redeemables). The second may have been paid for through an early sale of South Sea Stock.

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:

- 26,000 was sold in one day, 14 June 1720, to various parties, including 3,000 to Thomas Guy and 500 to Fauquier.
- 6,000 was subscribed into South Sea Stock. The first subscription for conversion of the Redeemables was opened on 14 July, with another one started on 4 August. Newton submitted his holdings in the first subscription³⁰.

The sale of his South Sea Stock that Newton directed Fauquier to carry out on 19 April, described in Section 7, 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

²⁸ For a listing and description of the large number of Redeemables and Irredeemables, see [54,55].

²⁹ Newton's investments in these annuities are covered by ledger entries in AC27/215:523, AC27/217:187, AC27/326:157, AC27/329:283, and AC27/341:3135.

³⁰ A transfer form, filled out and signed by Newton is in a private collection, and is reproduced in [36].

Sea Stock. This security only moved decisively above £350 around 19 May. Hence it is likely that the prices obtained by Newton were around that range. If that is correct, 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.

As the bubble continued inflating, though, 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 700³¹, 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 £3,240³². 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.) 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, likely 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. He almost surely suffered additional losses from later transactions involving the Irredeemables and cash, discussed in the next two sections.

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 16,300 South Sea Stock that he had in mid-1721, as discussed in Section 9. 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 8, strongly supports the theory that all his investments were in South Sea Stock in mid-1721.

³¹ *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.

³² Table 1 and the final results of conversion in [2], vol. 2, p. 300.

12 Newton and the Irredeemables

The letter of 27 July 1720 to Fauquier cited in Section 7, point E reads ([15], pp. 19–20; [34], 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. 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 [34], vol. 7, pp. 96–7.)

The first subscription of the Irredeemables opened at the end of April, with the second on 27 July. The conversion terms that were offered by the South Sea Company for Long Annuities in the second subscription ([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. Those bonds 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 2600 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 1543.72 South Sea Stock for every £100 per year of Long Annuities ([2], vol. 2, p. 301). 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.

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. This is a misleading suggestion, though. 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. He did participate in a later money subscription, as shown in Section 7, 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 3 suggests he continued to hold onto an optimistic outlook far into 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 three were in April and June, and the the fourth one, at £1,000 for 100 South Sea Stock, on 24 August. Records of investors in those subscriptions are available³³. Newton is not listed in the first three subscriptions, but does appear in the 4th subscription, for 500 South Sea Stock. This meant that he signed 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, point F of Section 7, must refer to this action.

When did the sale to Read take place? Newton's letter is not dated, but it had to be after 21 February 1721, as 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 1721³⁴. That appointment followed the flight to the Continent a month earlier of Robert Knight, de Gols' notorious predecessor, who was a 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 England³⁵.

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

³³ Parliamentary Archives, HL/PO/JO/10/5/57 through HL/PO/JO/10/5/63.

³⁴ Minutes of the Court of Directors of the South Sea Company for that day, British Library Add MSS 25500.

³⁵ 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 his post at the Bank.

what they had already paid. However, 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 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 the dividends over that period, which were a bit more than he could have obtained on secure short-term securities). 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.

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.

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 to any single investor 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 months³⁶. Prices of South Sea Stock by that time were down substantially from the levels they had reached earlier that summer. Already 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 peak³⁷. On 22 and 23 August the price was down to around 750³⁸. 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. At the end of August, there was substantial and growing unease among the investing public [8]. 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 irrational 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.

³⁶ 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. Hence they were subject to counterparty risk as well as discounting for the value of delayed payment.

³⁷ *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.

³⁸ *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.

14 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. 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/10/2/157³⁹. 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 instalment of £1,000 on 25 March 1725 but then stopped, he would have been entitled to 100 of South Sea Stock.

³⁹ This set is actually referenced by Dale et al. ([13], 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 (private communication) also found these documents, after the publication of his papers [41,42].

The evidence of this paragraph does not prove that the financial markets at the time of the South Sea Bubble were rational. However, 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 Conclusions

This paper provides new evidence that substantiates the popular story about Newton and the South Sea Bubble. He definitely lost a substantial sum in it, and did so in spite of his brilliance and familiarity with the contemporary financial markets. What is most interesting is that he started out as a skeptic, which, in retrospect, was the correct attitude. He did realize substantial gains on his very early South Sea investments, at about the same time that another famous skeptic, Thomas Guy, started cashing in his huge profits. Unlike Guy, though, Newton changed his mind, and put all his funds into the South Sea venture at its peak. He was more optimistic than many of the investors he interacted with on financial issues. He even continued to have high hopes for a profitable outcome through the initial rapid collapse phase of the Bubble. His brilliance did not provide him with the correct investment insights, and, as one of the popular stories about him states, he could not “calculate ... the madness of people.”

Newton’s South Sea misadventures are more than just another example of a genius succumbing to the prevailing groupthink of an investment mania. They suggest 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. [7,26,27,28]. 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. So far he is the only example 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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