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Monika Gisler

Tulip Mania?

The Dutch Tulip Bulb Episode (1636-1637) Revisited

Past bubbles are often pointed to in moments of crisis, irrational behavior, or moments of rupture in the evolutionary trends of human societies. Examples include the South Sea Bubble in 1720, the Great Crash of October 1929, Black Monday in 1987, and the ICT bubble of 2000. The tulip mania of the years 1636 and 1637 in the Netherlands is a quintessential example in this regard, and is often cited as the first known market bubble in history. Its essential feature is that rare bulbs were hard to produce but once obtained, were relatively easy to propagate. As a consequence, tulip bulb prices rose dramatically in late 1636, only to collapse in February 1637, ending the first well-known bubble episode.

Whether or not a tulip bubble was present has ever since evoked heated debates among economists and historians of economics. The difficulties are influenced chiefly by the underlying model and by the question of whether one believes in the efficient-market theory. One side holds that the tulip episode was not a mania at all, but is explainable by the volatility of the prices, i.e. the market fundamentals. The other side underlines that an efficient market hypothesis, which insinuates that all human actions/reactions are rational, fails to address the complexity of the problem. The paper outlines some of the most influential positions of the debate in order to evaluate the underlying intellectual ‘fundamentals’ of a crisis.

I

Economic crises frequently prompt analogies with the past.¹ Generally it is the history of past bubbles that is pointed to in moments of crisis, irrational behavior, or moments of rupture in the evolutionary trends of human societies. Examples include the South Sea Bubble that is said to have ended with the first huge market crash in England in 1720, the Great Crash of October 1929, Black Monday in 1987, the internet bubble of 2000, and so on. This challenges social scientists to reflect on the factors that brought these crises about.

The concept of bubbles (sometimes referred to as speculative bubbles, market bubbles, price bubbles, financial bubbles or speculative mania), however, is not as clear-cut as it appears at first sight. Delving into the literature in economics and finance on the topic of bubbles, to seek a definition of what a bubble is in an effort to arrive at a suitable theoretical framework, reveals that authors do not provide a common, unambiguous definition.² In a recent paper, economist Maureen O'Hara provided a review of definitions of bubbles and offered a somewhat disenchanting conclusion: "Are there bubbles? Are markets really irrational? I am not sure. I do know that markets are very hard to predict and thus can seem 'irrational'. But I prefer a more neutral view."³ A very general definition, nonetheless, is that in a bubble speculators buy an asset knowing that the price is far above any 'fundamental value', on the expectation that prices will rise further before they eventually crash. As prices cannot rise indefinitely, such a bubble must involve an 'irrational expectation' – a belief that the person you are offering an asset to will be willing to buy the asset and will not see the crash coming.⁴

1 I am grateful to Anne Goldgar, King's College London, for discussing some relevant points with me in an early stage of this manuscript; and to Didier Sornette, ETH Zürich and Fariba Hashemi, EPF Lausanne, for commenting on the paper.

2 John K. Galbraith, *A Short History of Financial Euphoria*, New York 1994; John K. Galbraith, *The Great Crash 1929*, Boston 1997; Robert J. Shiller, *Irrational Exuberance*, Princeton, NJ 2000; Didier Sornette, *Why Stock Markets Crash. Critical Events in Complex Financial Systems*, Princeton, NJ 2003; Charles P. Kindleberger (and Robert Aliber), *Manias, Panics, and Crashes. A History of Financial Crises*, 5th edition, New York 2005; Utpal Bhattacharya, Xiaoyun Yu, *The Causes and Consequences of Recent Financial Market Bubbles: An Introduction*, in: *The Review of Financial Studies* 21 (2008), p. 3-10.

3 Maureen O'Hara, *Bubbles: Some Perspectives (and Loose Talk) from History*, in: *The Review of Financial Studies* 21 (2008), p. 11-17, here p. 16.

4 Kindleberger, in the *New Palgrave*, defines a bubble as a "sharp rise in price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further rises and attracting new buyers – generally speculators interested in profits from trading in the asset rather than its use or earning capacity. The rise is usually followed by a reversal of expectations and a sharp decline in price often resulting in financial crisis." Charles Kindleberger, *Bubbles*, in: John Eatwell, Murray Milgate, Peter Newman (eds.), *The New Palgrave – A Dictionary of Economics*, vol. 1: A to D, London 1987, p. 281. Whether bubbles are necessarily followed by enduring crises has been questioned occasionally, in that it has been contended that bubbles can also have positive

The tulip mania of 1636/1637 in the Netherlands (also called the Dutch tulip speculation, or the tulip craze) is a quintessential example of a bubble in the literature. It was and still is often cited as the first known bubble in history.⁵ The tulip mania is understood as a period of the Dutch Golden Age when contract prices for bulbs of the newly introduced tulip reached extraordinarily high levels (specimens allegedly selling for the equivalent of more than US\$ 30,000 in today's terms) and then suddenly collapsed. Whether or not a tulip bubble actually occurred has stimulated heated debates among economists and economic historians.⁶ Whereas some bluntly refer to the episode as a bubble, others reject the idea entirely. The disagreement stems from a clash between those who believe that markets are always rational and efficient and those who call attention to the ubiquity of financial crises. A particularly interesting divergence in the discussion is whether the traders and the markets are considered to have behaved rationally or not.

It is interesting to follow the accounts of some economists and economic historians, and see how they dealt with the event, so as to illuminate some of the underlying intellectual 'fundamentals' of this crisis. This helps to shed light on the difficulties of defining a past economic episode as a bubble that is claimed to have provoked a crisis. In what follows I will first outline the early relations of this 'first bubble' (sections II and III), will go through the debate by choosing the most important and famous accounts of the episode (section IV), and will lastly draft the position of Anne Goldgar (section V). Conclusions are in section VI.

effects on the economy and society in the long run by creating productive systems (infrastructure, technology, etc.); see Carlotta Perez, The double bubble at the turn of the century: technological roots and structural implications, in: *Cambridge Journal of Economics* 33 (2009), p. 779-805; Monika Gisler, Didier Sornette, Bubbles Everywhere in Human Affairs, in: Lučka Kajfež-Bogataj, Karl H. Müller, Ivan Svetlik, Niko Tos (eds.): *Modern RISC-Societies. Towards a New Paradigm for Societal Evolution*, Wien 2010, p. 117-34.

5 Paul Samuelson in 1957 even used tulip mania interchangeably with 'Ponzi scheme', 'chain letter' and 'bubble'; see Peter M. Garber, *Famous First Bubbles*, Cambridge, MA, London 2000, p. 130.

6 References citing the tulip mania as the first bubble can be found in Peter M. Garber, Tulipmania, in: *The Journal of Political Economy* 97 (1989), p. 535-60, and Anne Goldgar, *Tulipmania. Money, Honor, and Knowledge in the Dutch Golden Age*, Chicago 2007. Many of these references deal rather superficially with the topic, simply rehashing earlier arguments.

II

Most narratives of the tulip mania relate to two accounts formulated centuries after the episode itself. One of them is Charles Mackay's 1841 *Memoirs of Extraordinary Popular Delusions and the Madness of Crowds*,⁷ a kind of synopsis of 'moral epidemics'. According to Scottish journalist Mackay (1814-1889), in 1634 "the rage among the Dutch to possess [tulip bulbs] was so great that the ordinary industry of the country was neglected, and the population, even to its lowest dregs, embarked in the tulip trade."⁸ Steadily increasing market prices for all sorts of tulip bulbs led otherwise sensible merchants, nobles, and artisans to supposedly spend all they had, and even borrow heavily to finance their tulip purchases. Starting in early 1637, according to the narrator, prices dropped sharply, ending the first well-known great bubble episode.

Mackay's description consists of only a few pages, and draws on indirect evidence based on a late eighteenth century account by a certain Johann Beckmann.⁹ Some of the legends and myths surrounding the tulip mania were fueled by this (and other) interpretation(s). For example, Mackay's version of the tulip mania contains a list of goods from the year 1636, the goods being compared to the value of a bulb and most probably used as an illustration of the purchasing power of the Dutch guilder (figure 1). Mackay – as well as others – read this inventory as a list of real prizes of bulbs, thus distorting the estimations made by future interpreters of this list, when pointing to the madness of prices requested for specific bulbs. Mackay is also the source of some of the anecdotes that continue to this day, e.g. valuable tulips being eaten by unsuspecting people; oxen, cheese and rye being delivered in exchange for a rare tulip, as well as the universality of the trade. None of these anecdotes stand up to verification.¹⁰

The other influential texts on the tulip mania were written in the 1920s and 1930s by the Dutch economic historian Nicolaas W. Posthumus (1880-1860), and from there, found their way into economics and history textbooks. Posthumus reprinted three pamphlets (the fictitious dialogues already used by Mackay) that were published shortly after the crash in February 1637. Although he also uses official documents, the pamphlets are the main sources for Posthumus' account.¹¹ The three so called

7 Charles Mackay, *Extraordinary Popular Delusions and the Madness of Crowds*, Boston 1932 (first edition 1841).

8 *Ibid.*, p.90. In fact, the "craze" for tulips (or bulbs respectively) did not start before November 1636.

9 Johann Beckmann, *A History of Inventions, Discoveries, and Origins*, 2 vols., 4th edition, London 1846.

10 Goldgar (see note 6), p.5, and 328-29, footnote 8.

11 Posthumus' articles on the subject are: Nicolaas W. Posthumus, *De speculatie in tulpen in de jaren 1636 en 1637*, in: *Economisch-historisch jaarboek: bijdragen tot de economische geschiedenis van*

Waermond-Gaergoedt pamphlets are in dialogue form, and were authored by Adriaen Roman in 1637. They play a moral function by portraying two key figures in the tulip trade, Waermond and Gaergoedt, the one taking part in the speculation, and the other remaining outside and, thus, on the safe side of the tulip trade. Needless to say, these pamphlets (along with dozens of such pamphlets as well as other satiric prose) are of moral intent, denouncing the irrational and immoral conduct of the speculators, and hence cannot be read as mere factual accounts. Nevertheless, these pamphlets, reprinted in Posthumus, have been taken literally by many of the later writers of the episode. What's more, Posthumus took only excerpts from the dialogues, leaving out important passages of information, being extremely careless about transcription and translation, making errors in nearly every word, changing punctuation and spelling, and making mistakes in figures. This has been neglected by later authors who sometimes used the bulb prices provided therein when assembling price series, in order to argue for or against the mania.

The sloppy conduct with historical sources has been criticized in a recent book on the tulip mania by the British historian Anne Goldgar. She argues that "although [the tulip episode] was a craze, although it was a wonder, although it was much talked of at the time and ever after, most of what we have heard about it is not true."¹² She vehemently urges authors not to use these careless accounts on the event any longer but to go back to the contemporary sources, an endeavor that she has undertaken at length.¹³

III

The difficulties associated with characterizing the tulip episode as a bubble were first stressed by Peter Garber¹⁴ in two papers from the late 1980s, and a book *Famous First Bubbles* from 2000 (the later is more or less a synopsis of his earlier papers).¹⁵ In these works, he revisits three bubble episodes, the Dutch tulip mania of 1636-1637, the Mississippi bubble of 1719-1720, and the closely related South Sea bubble of

Nederland 12 (1926), p.3-99; idem, *The Tulip Mania in Holland in the Years 1636 and 1637*, in: *Journal of Economic and Business History* 1 (1929), p.434-66; Goldgar (see note 6), p.328.

12 Goldgar (see note 6), p.7.

13 Ibid., p.328-29. Unfortunately, albeit criticizing the economists and the economic historians for not dealing accurately with the historical sources and literature, Goldgar herself ignores most of the economic and statistical literature on the tulip mania and hence does not confront the claims made by this literature.

14 Peter M. Garber is a global strategist at Global Markets Research at Deutsche Bank and Professor of Economics at Brown University.

15 Garber (see note 6); Peter M. Garber, *Famous First Bubbles*, in: *The Journal of Economic Perspectives* 4 (1990), p.35-54; Garber (see note 5).

1720, offering an economic analysis based on some, probably reliable though not extensive, contemporary sources. His data, namely the time series of prices, is mainly derived from records such as the ones provided by Krelage and the less reliable ones from Posthumus.¹⁶ In the three examples, he found evidence to explain observed price dynamics by rational behavior.

The Dutch tulip mania is the story of how newly developed varieties of bulbs resulted in *prima facie* madness and rapid price decline. Criticizing the standard versions of the tulip mania episode, Garber focuses on the economic fundamentals (i.e. a set of variables that is assumed to drive asset prices) behind the events occurring in the years after 1634. This means that, to the extent that serious model forecasts of asset prices fail, the prediction error measures the bubble. Therefore, Garber puts forward an analytical definition of the term bubble, and hence uses his framework to examine the particulars surrounding the tulip mania episode.

In line with standard financial economic theory, he defines a bubble as an “asset price movement that is unexplainable based on what we call fundamentals”.¹⁷ He consequently designates the term bubble as a “fuzzy word filled with import but lacking a solid operational definition”.¹⁸ He argues that to call a sharp financial expansion that collapses a ‘mania’ or a ‘bubble’ is too superficial and should hence be elaborated by deeper insight. In fact, Garber is so cautious about defining a bubble that he suggests only using the term to explain anomalies in market behavior as a ‘last resort’. Bubbles do not explain events thoroughly – he criticizes – they are merely a name attached to a financial phenomenon that has not been sufficiently understood.¹⁹

Concerning the tulip episode, Garber points out that the rare varieties of bulbs fetching high prices among professional traders, did not necessarily reflect an irrational behavior. On the contrary, the tulips could be used to grow many more valuable hybrids, often earning their purchasers far more than they invested. The tulip’s value is related to the fact that rare bulbs are hard to produce (note that the trade was in bulbs only, not in flowers). The tulip can propagate either through seeds or through buds that form on the mother bulb. Properly cultivated, the buds can directly produce another bulb. By the end of the season, the original bulb is replaced by a clone, the primary bud that is now a functioning bulb, and by a few secondary buds. Asexual

16 E.H. Krelage, *Bloemenspeculatie in Nederland*, in: *De Tulpomanie van 1636-’37 en de Hyacintenhandel 1720-’36*, Amsterdam 1941; idem, *Drie eeuwen bloembollenexport. De geschiedenis van den bloembollenhandel en der Hollandsche bloembollen tot 1938*, ’s-Gravenhage 1946; Posthumus (see note 11).

17 Garber (see note 5), p.4.

18 Ibid., p.4.

19 Ibid., p.124. Garber goes as far as to call “the wonderful tales from the tulipmania [...] catnip irresistible to those with a taste for crying bubble,” further adding: “So perfect are they for didactic use that financial moralizers will always find a ready market for them in a world filled with investors ever fearful of financial Armageddon.” Ibid., p.83.

reproduction through buds, the principal propagation method, produces an increase in bulbs at a maximum annual rate of 100 percent to 150 percent in normal bulbs. A bulb produced directly from seed requires 7 to 12 years before it flowers. The flowers appear in April or May and last for about a week. The amount of time required before the secondary buds flower depends on the size of the bulb produced from the bud. In June, bulbs can be removed from their beds but must be replanted by September. To verify the exchange of a specific variety, spot trading in bulbs had to occur immediately after the flowering period, usually in June. A purchase between September and June was necessarily a contract for future delivery.

What's more, tulips are subject to invasion by a mosaic virus that causes an effect called 'breaking', producing remarkable patterns on the flower, some of which are considered beautiful. The pattern imposed on a particular flower cannot be reproduced through seed propagation, only bulbs may themselves eventually 'break' at some unknown date. A specific pattern can be reproduced by cultivating the buds into new bulbs. This brings high and rising speculative prices for rare species. The bulbs that commanded high prices produced unique, beautifully patterned flowers, whereas common tulips were sold at much lower prices. The cause of color breaking, though documented for several centuries, was not identified as a virus disease until the early 1900's.

The market for bulbs was limited to professional growers until 1634, but by the end of that year a more general class of speculators participated. This was an argument brought forth by Posthumus who accounts for the speculation by the entry of non professional traders into the market.²⁰

Typically, the buyer did not immediately possess the money to be paid on the settlement date, and the seller did not immediately possess the bulb. Neither party intended a delivery on the settlement date; only a payment of the difference between the contract and the settlement price was expected. It is unclear, though, how the settlement price was determined. Trading became extensive enough in the summer of 1636 that traders began meeting in numerous taverns, in groups called 'colleges', where trades were regulated by a few rules governing the method of bidding, whereas earlier deals had employed written contracts entered into before a notary.²¹ As a

20 However, this was not affirmed by Anne Goldgar's study, which looked at the first thirty years of the seventeenth century. This was a time when professional florists started commercializing the trade in tulips, which, due to the fashion for owning tulips, eventually contributed to making prices rise. A rapid increase in prices can only be verified for the months after October 1636; Goldgar (see note 6), p. 197, and *passim*.

21 Jan de Vries and Ad van der Woude, *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500-1815*, New York 1997, p. 150-51, have pointed to the fact these contracts set up in the taverns were unenforceable as public officials repudiated these speculations (even though not officially). Consequently, once the mania collapsed, the above mentioned pamphlets appeared denouncing the irrational and immoral conduct of the speculators.

consequence, formal futures markets developed in 1636 and were the primary focus of trading before the collapse.

Garber holds that, as a bet on the price of the bulb on the settlement date, this market was no different in function from current futures markets. The operational differences were that the contracts were not continuously tied to the market, that is, re-priced according to daily price fluctuations, and required no margin deposits to guarantee compliance. Instead, they consisted of commitments by individuals, not the actual exchange. As Garber states, it is unclear which date was designated as the settlement date in the college contracts. No bulbs, however, were ever delivered under the deals struck in the new futures markets prior to the collapse, because of the necessity of waiting until June to unearth the bulbs.

Wealthy tulip fanciers, who traded regularly in rare varieties, did not participate in the new speculative markets. Even after the collapse of the speculation, they continued to trade rare bulbs for large amounts. This required substantial capital resources or access to the financial credit markets. During most of the period of the tulip speculation, high prices and recorded trading occurred only for the rare bulbs. Common bulbs did not figure in the speculation until November 1636.

Garber's argumentation builds upon time series data of prices of particularly rare species (sixteen charts of the prices of particular bulbs).²² A straight line from circa 1622 to 1637 gives an impression of gradual increase, whereas there might have been a sharp rise in the last weeks or month, as is shown in some charts. Using the eighteenth century price depreciation rate as a benchmark, and continuing to track the price of expensive bulbs after the mania, Garber infers that any price collapse for rare bulbs in February 1637 could not have exceeded seventeen percent of peak prices. Thus, he concludes, the crash of February 1637 for rare bulbs was not of extraordinary magnitude and did not greatly affect the normal time series pattern of rare bulb prices.²³

The time series data on prices show how an increasing demand caused steadily increasing prices. However, Garber also shows that rare species of bulbs eventually became common species because supply was expanded over time, resulting in lower prices in line with what price theory predicts.²⁴ Shifts in demand and supply of bulbs thus perfectly explain price movements, he argues, because as soon as the experimentation of growing new species was completed, production for the market took off. In particular, he concludes, the high prices of rare bulbs were a standard

22 I leave aside for now that these prices, which Garber took from Krelage and Posthumus are – according to Goldgar – inaccurate. Furthermore, one wonders whether there are enough data at all in order to construct reliable time series and other patterns.

23 Garber (see note 5), p.80-81.

24 Ibid., p.78.

feature of markets in newly developed varieties, as was a rapid price decline.²⁵ As a consequence the most famous aspect of the mania, the extremely high prices reported for rare bulbs and their rapid decline, reflect a particularly volatile period in bulb markets, and not financial market irrationality.²⁶

IV

The conclusions of Garber's study have been vigorously disputed by Charles Kindleberger, Edward Chancellor, and others. They have heavily rebutted the interpretation of the tulip mania as a case of rational market behavior.

Charles Kindleberger (1910-2003), former Professor of economics at MIT, in a review of Garber's book,²⁷ points to the fact that there is an ongoing debate between those who believe that markets are always rational and efficient, resting on fundamentals, and those who call attention to a series of financial crises in the past centuries. Although he admits that markets are most often reliable, he argues that, depending on the market's complexity, they may get caught up in untoward activities occasionally. This is an argument against one of Garber's claims stating that the market for bulbs was not out of line, even though traders were pursuing potentially irrational strategies. The point is that Kindleberger does not believe in the efficient markets hypothesis. Many investors, he claims, do poorly in the market because they chase the latest fashion. This is herd behavior. Only if one is assured that all actions and reactions are always rational, he claims, can bubbles be explained in terms of the speculation of rational investors.²⁸ One could counter that the efficient market hypothesis claims that individuals need not to be fully rational at all times, the collective action of non-rational agents translating nevertheless into a global behavior that is rational or efficient.

25 Ibid., p. ix.

26 Ibid., p. 123.

27 Charles P. Kindleberger, Review of Peter M. Garber, *Famous First Bubbles: The Fundamentals of Early Manias*, in: EH.Net Economic History Services (August 15, 2000), <http://eh.net/bookreviews/library/0281>. Published by EH.NET, August 2000.

28 Kindleberger (see note 2). The efficient market hypothesis (attributed to Eugene Fama) claims that financial markets are always efficient in that all information is publicly available and thus prices on traded assets already reflect all past publicly available information at the time the investment is made. Scholars have disputed the efficient-market hypothesis both empirically and theoretically. Some argue that the argument that markets are always rational, efficient and collate all available information, is difficult and perhaps impossible to debunk since any behavior could in principle be attributed to some rational speculative strategy. Behavioral economists on the other hand attribute the imperfections in financial markets to a combination of cognitive biases such as overconfidence, overreaction, representative bias, information bias, and various other predictable human errors in reasoning and information processing.

According to Kindleberger, a mania is basically just excessive speculation in the market. It follows that if one observes someone else, i.e. a friend or acquaintance – and this was likely the case in the tulip mania, as Anne Goldgar shows – making money through speculative investments, one tends to follow. As more and more people begin to invest on speculation, people that would normally be indifferent to this type of behavior decide to invest. Furthermore, when speculation is based on hope that is unfounded, or shown later to have been unfounded, as was the case in the tulip mania, it is difficult to characterize it as a fundamental.²⁹

This evokes the question of whether or not herd behavior was at play here. It has been stated by Garber, most likely based on Posthumus, that after 1634 nonprofessional buyers fueled by credit entered the trade and thus pushed the trade into a state of mania.³⁰ Even though one can agree with Robert Shiller³¹ that individual investors get advice from professionals and can understand the market as a whole, the phenomenon of herd behavior was at play here. Although not all tiers of Dutch society were equally involved, as Goldgar shows, the interest in tulips became larger over time and peaked in late 1636, early 1637.

This is also one of the major points made by the British banker and historian Edward Chancellor, when discussing the tulip mania in his book on the history of financial speculation.³² He brings forward the argument that the purchase of any tulip bulb, whether variegated or plain, in the winter of 1636, could only be justified by the hope that the bulb could be sold quickly at a higher price to someone else. (Furthermore, buying bulbs in the ground in the winter, not knowing whether they will produce exotic offshoots until unearthed in June, and subsequently not knowing whether these offshoots will produce exotic flowers the following years, was in fact basing the purchase on the hope that this would occur.) Chancellor adamantly rejects Garber's hypothesis³³ as 'historical revisionism' in the name of the efficient market school of economic thought. According to the latter, bubbles or mania cannot exist as market prices always reflect their intrinsic value.

Chancellor further argues that the argument brought forth by Garber, that the pattern of sharp price rises and declines found for other flowers, such as eighteenth century hyacinths, does not disprove the existence of a tulip bubble. On the contrary, Chancellor concedes that "one might argue that the existence of later 'bubbles' suggests that the Dutch flower market, like the stock market, was particularly susceptible to

29 Kindleberger (see note 27).

30 It has yet to be investigated whether there was more credit available after 1634. In general, bubbles are said to being fueled by excessive credit and/or influx of money coming from other sources, flooding the market with money.

31 Shiller (see note 2).

32 Edward Chancellor, *Devil Take the Hindmost. A History of Financial Speculation*, New York 2000.

33 Garber (see note 6).

outbursts of speculative euphoria”.³⁴ In fact, Garber initially³⁵ admitted that the prices of the common breeder bulbs, which increased twentyfold during the last phase of the boom, and eventually rose to unexplainable heights, could not be explained. He later³⁶ ascribed this price movement to the outbreak of the bubonic plague that occurred at the time, and simply dismissed the trade in the taverns as “no more than a meaningless winter drinking game, played by a plague-ridden population that made use of the vibrant tulip market”.³⁷ This is, indeed, too easy an explanation for a rather serious and complex (social) behavior.

Unfortunately, both economists fail to discuss another topic brought forth by Garber. He claims that speculation is conventionally defined as an attempt to profit from changes in market price (forgoing current income for a prospective capital gain is deemed speculative).³⁸ Garber now implies that, to the extent that rare bulbs traded on futures markets, no one arbitrated the spot and futures markets. To hedge a position with a sale in the futures market, Garber argues, would have required the future purchaser to have substantial capital or access to sound credit; substantial risk of noncompliance with the deal in the futures market would have undermined the hedge. However, as participants in the futures markets faced no capital requirements, there was no basis for an arbitrage.

Garber’s view is endorsed by UCLA economist Earl Thompson in an article published in 2006.³⁹ Thompson, however, criticizes Garber for seeming to have overlooked an alleged first crash in tulip prices in October 1636, a price-decline Thompson recognizes as fundamentally based. After that, a twentyfold price rise from early November 1636 to early May 1637 can be observed. In conclusion, Thompson holds that tulip contract prices before, during, and after the tulip mania provide a remarkable illustration of efficient market prices. To support this hypothesis, he completes Garber’s reported tulip price data, even though it remains unclear on what basis.

Thompson maintains his argumentation by citing the events that took place after the crash on 5 February 1637. After the tulip speculation collapsed, settlements on upcoming contracts were suspended. On 24 February 1637, delegates of florists meeting in Amsterdam proposed that sales of tulips contracted on or before 30 November 1636, should be executed and that for later contracts, the buyer should be given the

34 Chancellor (see note 32), p. 25.

35 In Garber (see note 6).

36 Garber (see note 5).

37 *Ibid.*, p. 81; see also Kindleberger (see note 27).

38 Chancellor (see note 32), p. xi.

39 Earl A. Thompson, *The tulipmania: Fact or artifact?*, in: *Public Choice* 130 (2006), p. 99-114. This article builds upon an earlier unpublished paper by Thompson and Jonathan Treussard (ca. 2004). The fact that Thompson, in his 2006 paper, once more drew on the pamphlets and other unreliable sources even though he was aware of Anne Goldgar’s work by then, teaches us a lesson about historian-economist-relations.

right to reject the deal on payment of ten percent of the sale price to the seller. The authorities did not adopt this suggestion. On 27 April 1637, the states of Holland decided to suspend all contracts, giving the seller the right to sell contracted bulbs at market prices during the suspension. The buyers would be responsible for the differences between the market prices and whatever prices the authorities eventually determined for contract settlements. This decision freed the growers to market the bulbs that would emerge in June. With the end of large-scale bulb trading after February 1637, records of transaction prices virtually disappeared. Prices no longer were publicly recorded, and only an occasional estate auction of an important florist would reveal the magnitude of prices.⁴⁰

Thompson now argues that futures contracts were legally changed into option contracts, a fact that had been systematically overlooked by previous economists who “failed to make the appropriate contract and price adjustments, thereby failing to describe the ‘tulipmania’ price pattern as a contractual artifact”.⁴¹ He emphasizes the fact that this conversion of contracts (from futures to options contracts) heavily influenced the expected, realized and unexercised prices. The values that were actually paid in the end were not the prices agreed upon in the futures contracts but rather the ones agreed upon after the crash, being a fraction of the agreed prices. The loss of money was thus far less significant than presumed up to now.

Yet, Thompson goes even a step further by claiming that this conversion already occurred after the alleged October price decline, referring to Mackay’s account as well as a citation of a contemporary, provided in the book by the historian and journalist Mike Dash.⁴² However, such an implication cannot be found in Mackay, nor is it to be found in any other archival record.⁴³ Thompson’s argumentation thus fails in this regard.

The argumentation, however, is very appealing in terms of the appraisal of the aftermath of the tulip mania, especially regarding the question of whether the bubble led to a (major) crisis, or not. Kindleberger, for example, stated that the wealth of households declined with the crash, resulting in people spending less. Should the loss of money have been less significant than otherwise stated, however, a crisis may not have actually occurred.

There must have been some sort of crisis though, as Doug French outlines in his article.⁴⁴ There is evidence of financial loss, he states, that may have resulted from

40 Garber (see note 5), p. 78.

41 Thompson (see note 39), p. 101.

42 Mike Dash, *Tulipomania. The Story of the World’s Most Coveted Flower and the Extraordinary Passions it Aroused*, London 1999.

43 Goldgar (see note 6).

44 Doug French, *The Dutch monetary environment during Tulipmania*, in: *The Quarterly Journal of Austrian Economics* 9 (2006), p. 3-14.

the tulip mania, since bankruptcies in Amsterdam doubled in number between 1635 and 1637. Yet French does not make it absolutely clear whether the number of bankruptcies is a predictor or causal factor of the tulip crash. Even though it must be assumed that these bankruptcies did not involve only tulip growers, they are nonetheless an indication of financial loss. In sum, French judges the tulip mania as the end result of government policy that expanded the quantity of money and thus fostered an environment for speculation and malinvestment (that can thus not be explained by the ‘fundamentals of the tulip market’). Dutch interest rates declined over the period and tulip bulb futures could be traded with no margin required. The Dutch government policy required that money be backed one hundred per cent by specie. This policy served to attract coin and bullion from throughout the world. The end result was a large increase in the supply of coin and bullion in 1630s Amsterdam. Free coinage laws served to create more money from this increased supply of bullion than the market demanded. This acute increase in the supply of money fostered an atmosphere that was ripe for credit creation and thus speculation, which manifested itself in the intense trading of tulips.

V

Anne Goldgar, a Reader in Early Modern History at King’s College, London, provides a monograph that differs in many ways from previous attempts to understand the tulip mania.⁴⁵ Her examination follows a cultural history thread, consulting contemporary data and archival documents. Her main message is that the Dutch tulip mania was a profound social and cultural disturbance that upset social values and harmony, but did not ruin the economy, as was often assumed. For the most part, the damage to the Dutch was a confusion of values (which explains all the pamphlets that came out after the crash), a breakdown of honor and of mutual trust, in fact a whole network of values was thrown into doubt. Financially, she argues – the tulip mania affected only a few and certainly not the rich.

This phenomenon arose in the Republic, Goldgar explains, due to the emerging social mobility that accompanied rapid commercial development during the Dutch Golden Age (and an atmosphere of speculation fostered by the government, as Doug French has maintained). Dutch trading was blooming in the seventeenth century, and Goldgar sees the tulips trade (in economic terms: a well developed asset market) as part of it, even though merely one artistic or investor preference within a broader thriving economy. From the start, the tulip trade was the province of certain social strata, building a network albeit not a homogenous social group: The first collectors

45 Goldgar (see note 6).

appreciated the flowers for their beauty, not their utility. Merchants and craftsmen grew tulips much as they collected paintings. Indeed, many tulip traders were also art collectors, dealers or painters. They sometimes traded art for bulbs. Buyers of tulips chased beauty and status as much as profit, at least in the beginning. Eventually, the urban society, merchants, and skilled craftsmen, some of the latter being fairly wealthy, followed. No peasants were involved, though, and neither were noblemen. Relatives barely did business with each other at all. Most of the involved were not professional traders, many only traded once, others were heavily involved, some even founded companies (eventually, six companies were engaged in the trade). Legal disputes over sold tulips and promised deliveries were common. In any case, tulip trading was socially limited, and did not embrace the entire society. The latter was a depiction of the pamphlets.

Excitement over tulips started in the early 1630s. Although no caesura can be seen in 1634 (as is usually stated in the literature; e.g. Posthumus sees the year 1634 as a turning point when non professionals entered the tulip market) the hype undoubtedly inflated from late 1636. One ‘Admiraal van der Eyck’ bulb, to give an example, in January 1637, could be bought for thousand ‘guilders’. That was about a three years’ income for a master carpenter, or a modest house in Haarlem.⁴⁶

The crash came in early February 1637, when prices fell by approximately ninety percent.⁴⁷ It remains unclear what prompted this (the rapidity of the price changes in January 1637 must have led some tulip-seekers to conclude that the price rises were unsustainable).⁴⁸ Yet, Goldgar asserts, the effects were modest. Tulip mania did not devastate the Dutch economy. Very few were affected financially. Though it is certain that some people lost a lot of money, there is no archival evidence suggesting that any of the involved merchants went bankrupt. Tulips were merely a sideline to their real professions. In any case, Goldgar explains, few buyers actually paid the exorbitant prices they had agreed. The crucial point is that this was a futures market.

46 Ibid., p.225.

47 Ibid., p.378.

48 Sornette (see note 2) has presented a general framework to characterize, quantify, model and predict financial bubbles and their aftermath. The main concepts, he explains, are imitation, herding, self-organized cooperation and positive feedback, leading to super-exponential growth and eventually to the development of endogenous instabilities. He concludes that most explanations other than cooperative self-organization fail to account for the subtle bubbles by which the markets lay the groundwork for a subsequent crash. According to this theory, the fundamental causes of the burst of bubbles lie in the maturation towards instability, due to positive feedbacks. As a speculative bubble develops, it becomes more and more unstable and very susceptible to any disturbance. Any tiny incident can then be a triggering factor for a crash. See also Anders Johansen, Didier Sornette, Shocks, Crashes and Bubbles in Financial Markets, in: *Brussels Economic Review* 49, 3/4 (2006); Zhi-Qiang Jiang et al., Bubble Diagnosis and Prediction of the 2005-2007 and 2008-2009 Chinese stock market bubbles, in: *Journal of Economic Behavior and Organization* 74 2010, p. 149-162, and references therein.

The flowers spent most of the year underground. Trades were made constantly, but were only paid for in summer when the bulbs were dug up. In the summer after the crash, most buyers simply refused to accept and pay for their bulbs. Some paid the sellers a small recompense, usually less than five percent of the agreed price. These modest payouts do not seem to have ruined anyone. The claim that the crisis disrupted the Dutch economy rests solely on the pamphlets, which – as stated above – were highly critical of the tulip trade and used the episode as a warning against greed, materialism, financial speculation and subsequent social disorder. Rather, the episode damaged the code of honor that underlay Dutch capitalism. When buyers reneged, trust suffered. Tulip mania was a social crisis, not a financial one, argues Goldgar. And, as we all know, the crash did not put the Netherlands off tulips.

Goldgar concludes that the crisis was less serious, less widespread and less damaging economically than has been asserted.⁴⁹ In fact, she tends to depict it as a ‘reckless gamble’ (same as Garber). Yet, she has to admit that one can also see it as a trade fraught with risks. The unpredictability of supply, the uncertainty of the markets and the inability to get speedy information about surrounding conditions were just a few factors. She concurrently acknowledges that some prices for some tulips jumped radically and unexplicably up after the planting season of autumn 1636 and crashed only months later (obviously the available figures suffice to illustrate so). The “suddenness of the price rise and of the tulip crash”⁵⁰ she feels needs explanation, pointing to the fact that prices after the crash were no more than ten percent of their previous values; otherwise this figure would not have appeared in a protocol of the ‘bloemisten meetings’ in Amsterdam on February 23, 1637. Furthermore, the behavior of sellers from 1637 through 1639, Goldgar observes, makes it plain that a major fall in prices afflicted the market. In the long term prices remained reasonably high for tulips. To explain this, Goldgar refers to supply and demand in a rational market (and hence agrees with Garber). After all, she understands the interest in tulips as fulfilling the needs of seventeenth century flowers enthusiasts and thus not as irrational and the trade as not being insane (even though it is hard to understand how one can be interested in a bulb that is supposed to flower in the summer, but no one is exactly sure what it would look like).

The tulip mania was not as wild as one has been led to believe, Goldgar argues. Some of the merchants who bought tulips, she writes, were enthusiasts (‘liefhebbers’) interested in the aesthetic side of the flowers, in the pleasure and sociability of collecting and the culture it entails. Others had a chiefly financial interest in tulips. But for either group, buying tulips was not insane since to buy what fulfills your needs

49 Yet, it is to point to the fact that many bubbles have crashed without major economic consequences. The best example in this concern is maybe the crash of October 19, 1987, which was worldwide, and of enormous loss, but of very weak economic effect.

50 Goldgar (see note 6), p.378.

can not be called irrational, she claims. All the more so as the enthusiasts collector's items were naturally likely to be expensive.

It was only after the burst, she explains, that the episode was labeled irrational, and not before, nor did anyone say before the crash that there was something intrinsically foolish about buying products that were expected to be sold later at a higher price. The unsustainability of the prices had not been predictable, she concludes, and a crash could not be foreseen. The value of a tulip, she underlines once more, was the value placed in it by its buyers and sellers. Tulip mania was only irrational after it burst, if the market had held, she claims, it would have been supremely sensible to invest one's money in tulip bulbs.

Yet, this is exactly what a bubble consists of. A bubble is rarely seen coming, and even if someone does, it is usually ignored. It is common, though, that people buy in order to sell later for a better price. Such behavior inevitably involves an irrational expectation, a belief that the person being offered an asset is willing to buy it in the expectation to sell it for yet a better price in the near future. When new options open up, and people feel ready, they dive into such opportunities, often without apparent concern for the risks and possible adverse consequences.

Goldgar interprets the consequences of the crash as a social disturbance rather than a financial wreck, but Kindleberger offers a somewhat different view. Siding with the economic historian Jonathan Israel,⁵¹ he heavily contests the general notion that no depressed aftermath means there was no preceding mania in the tulip episode. Israel has shown that the tulip mania should be viewed against the background of the general boom and as a mania of small-town dealers, tavern-keepers and horticulturalists with the wealthy for the most part making money in other ways. Kindleberger endorses this implication by pointing to the fact that the Dutch economy slowed in the 1640s before recovering after 1650 (there are no price data for the period immediately after the crash). The decline in tulip prices, Kindleberger explains, led to a decline in economic activity, because households were less eager to spend as their wealth declined.⁵² The bankruptcies in Amsterdam that doubled between 1635 and 1637 – as indicated by Doug French⁵³ – seem to provide another indication of financial, albeit not necessarily profound, loss.⁵⁴

51 Jonathan Israel, *The Dutch Republic. Its Rise, Greatness, and Fall 1477-1806*, Oxford 1995, especially p.533.

52 Kindleberger (see note 2), p. 115-17. Unfortunately Kindleberger himself reuses some of the stereotypes provided by the unsound sources.

53 French (see note 44), p.3-14.

54 Sornette in his work on financial bubbles found that they are not necessarily followed by crashes. Instead, he delineates them as "non-sustainable transient regimes" that end at a tipping point, beyond which a new regime is established; see Sornette (see note 2).

VI

This survey of the literature of the seventeenth century tulip mania shows that the problem of how to define a bubble is ambiguous. Its definition is fundamentally influenced by the underlying economic model, which provides a reference point to what is 'normal'. For instance, assuming that markets are always rational and efficient poses a fundamental problem of measuring something that is deemed impossible by construction. It has been emphasized at various occasions that the efficient market theory, highly influential in Peter Garber's reconstruction of the tulip mania, and building on the argument that markets are always rational, efficient and collate all available information, is difficult and perhaps impossible to debunk since any behavior could in principle be attributed to some rational speculative strategy. Behavioral economists on the other hand attribute the imperfections in financial markets to a combination of cognitive biases such as overconfidence, overreaction, representative as well as information biases.

It is indeed difficult to decide what was the case here. Anne Goldgar made it very clear that the craze over the tulips in seventeenth century Amsterdam, Haarlem and a few other Dutch places was restricted to "some tulip enthusiasts", asserting that full information was available to everyone. As a consequence, both she and Garber explain the craze over tulips with the volatility of the prices, the factors of supply and demand. Both assert that full information was available to everyone. The critiques by Chancellor and Kindleberger in contrast made it clear that an efficient market hypothesis that insinuates that both the markets as well as human actions/reactions are rational, fails to address the complexity of the problem. How much volatility is justified? And is it really the case that all humans are fully rational at all times? It is especially the argument that when speculation is based on hope (or, for that matter, uncertainty) that it is very difficult to characterize an episode by its fundamentals. Even Goldgar asserts that trading tulip bulbs in the winter season of 1636/1637 was a business fraught with uncertainty.⁵⁵ Even when one was interested in tulips for aesthetic reasons or because they were in fashion, they could not be relied upon. Tulips that bloomed one way in the summer could not necessarily be counted on to look the same the following year. Except in the summer, a sale remained essentially theoretical as long as the bulbs were planted in the earth. This enabled irrational behavior even though the trade was organized as a futures market (and thus only few buyers actually paid the prices they had agreed upon).

Goldgar also indicated that some had in fact financial interests in the tulips. It was the traders' enthusiasm for the flowers that made them chase the fashion (tulips) and invest heavily in anticipation of high returns. Even though not everyone followed (in

⁵⁵ Goldgar (see note 6), p.217 and *passim*.

fact some tiers of society did not follow at all), many did, and not only individuals with a professional interest. Enthusiasm for the tulip led to euphoria and thus to herd behavior, a common dynamic of a bubble. More so, since, as French has pointed out, Dutch government policy by expanding the quantity of money fostered an environment for speculation.

Such herd behavior was what one would call irrational. Does this suffice to call the incident a bubble? As Thompson and Goldgar have argued (and Kindleberger and French have rebutted), no serious financial crisis occurred after the tulip mania and its crash in 1637. In fact, even though some people involved must have suffered heavily after the crash, many did not, and the Dutch economy as a whole seems not to have experienced profound financial losses (although the literature is not in a consensus upon this point). A reason for this might be that tulips as such are not a vital good (compared to, say, real estate). That there was a crisis nevertheless, is evidenced by the emergence of the pamphlets issued by the Dutch government after the crash in February 1637. The fact that so many pamphlets appeared shortly after the episode was an indication of a crisis, whatever kind of crisis that might have been.

Crises are defined as dramatic and rapid changes of a system as a culmination of a complex preparatory stage. They have fundamental societal impacts, emerging from collective processes.⁵⁶ Financial distress can be one of them, it is not imperative, though.⁵⁷ Goldgar herself has made it very clear that although tulip mania may not have constituted an economic crisis, it was a considerable shock to Dutch society nevertheless, in that an entire network of values was thrown into doubt. This resulted in a confusion of values, the breakdown of honor, and the destruction of trust.

Writers of the pamphlets have evidenced this plainly. They viewed the upheaval as a distortion of moral order and a proof that concentration on the “earthly, rather than the heavenly flower could have dire consequences”.⁵⁸ The tulip mania thus holds a moral notion in that it points to a crisis, if not a financial one, then a crisis of values, of reciprocal bonds of sentiment and kinship, and of social order as such.

56 Galbraith (see note 2).

57 And it has been made clear repeatedly in this paper that it is not necessarily an ingredient of a bubble.

58 Goldgar (see note 6), p.260-261.