

How Much Is a Tulip Worth?

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To present-day investors, the tulip is nothing more, nothing less, than a lovely garden flower. It grows from a bulb. It has leaves. And it has a stem—from 4 inches to more than 30 inches tall—on the tip of which, one large, bell-shaped flower usually develops. The flower may be almost any solid color, and some tulip flowers are two-toned. (If the flower is streaked with colors, however, the cause is a viral disease that affects the plant's color but not its health.)

Thousands of varieties of tulips have developed from a few species. Almost all the cultivated kinds of tulips were developed from tulips of Asia Minor that were brought to Vienna from Constantinople (now Istanbul) in the 1500s. The name "tulip" comes from a Turkish word meaning turban, which was given to the flower because the beautiful blossoms look a little like turbans. Popular garden varieties of tulips include the Darwin hybrids and the Triumphs, Lily-Flowered, Fringed, and Parrot tulips. Tulips belong to the lily family, *Liliaceae*. The tulip brought to Europe in the 1500s is *Tulipa gesneriana*.

Although tulips grow in many parts of the world, they are generally associated with the Netherlands, where tulip cultivation has remained an

important industry from the time of their introduction into Europe to today. Tulip cultivation is also important in the northwestern part of the United States. Billions of tulip bulbs are produced every year. According to the 1994 *World Book Encyclopedia*, Dutch growers produce nearly 2,000 varieties.

After the tulip was brought to Europe, it became the most fashionable flower in England and Holland. Interest in the flower developed into a craze in Holland between 1634 and 1637 that is referred to as "tulipmania." Individual bulbs sold for huge prices. Although many of today's investors are vaguely familiar with this tulipmania, most do not realize just how high tulip prices reached in this period or how destructive the mania became.

A fascinating early account of Holland's tulipmania can be found in Mackay's (1841) classic *Memoirs of Extraordinary Popular Delusions and the Madness of Crowds*. Mackay related details of tulipmania, the Mississippi Scheme, the South Sea Bubble, witch hunts, slow poisoners, and other similar phenomena. His objective was to recount remarkable instances of

...moral epidemics which have been excited, sometimes by one cause and sometimes by another, and to show how easily the masses have been led astray, and how imitative and gregarious men are, even in their infatuations and crimes. (p. xvii)

Mackay's underlying assumption is clearly that aberrant

crowd behavior in the world of investing bears resemblance to aberrant crowd behavior in the wider world.

This article first develops the present equivalent of a typical price paid for a tulip bulb in Holland during the height of tulipmania. For some, such a price will be nothing more than an interesting historical artifact. For others, the extremes of tulipmania will offer useful insights about the role played by noneconomic factors in U.S. asset pricing. In this context, the current pricing of stocks of Internet/online service providers may be relevant.

Tulipmania

In the 1600s, the Netherlands was a major sea power that accounted for roughly half of Europe's shipping trade. In 1602, Dutch firms trading with the East Indies combined to form the Dutch East India Company. The Dutch West India Company, founded in 1621, opened trade with the New World and western Africa. In 1624, the Dutch West India Company colonized New Netherland, which consisted of parts of present-day New York, New Jersey, Connecticut, and Delaware. In 1626, Dutch colonists bought Manhattan Island from the Native Americans for goods worth about \$24. They had established New Amsterdam (now New York City) the year before.

Expanding trade and the international influence of a great colonial empire made Amsterdam a major commercial

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city, and gave the Dutch one of the highest standards of living in the world. It was during this "golden age" that tulips were introduced to the Netherlands.

Conrad Gesner is credited with bringing the first tulip bulbs from Constantinople in 1559 to Holland and Germany, where they became much sought after among the rich and well-to-do. By 1634, the rage for possessing tulips had spread to the middle classes of Dutch society. Merchants and shopkeepers began to vie with one another in the preposterous prices being charged for simple tulip bulbs. Men were known to have paid a fortune for a single bulb—not with the idea of reselling at a profit but simply for private admiration. Later, investors began to accumulate tulip bulbs for resale and trading.

Tulipmania Prices in Today's Money. Mackay cites the prices of tulip bulbs in florins. For example, he notes that fortunes of as much as 100,000 florins went to the purchase of as few as 40 tulip bulbs. Various tulip bulbs were fetching 1,260-5,500 florins each at the height of tulipmania in 1635.

The florin was a coin that

originated in the Italian city of Florence in 1252. Made of pure gold, the original florin weighed about an eighth of an ounce (3.5 grams). Florins became popular for trade during the economic expansion of Europe from the 1200s to the 1400s. Ironically, the coin's name comes from an Italian word meaning little flower. It refers to a lily, the symbol of Florence, which appears on one side of the coin.

Florence stopped making florins in the early 1500s, but many European countries, including the Netherlands, produced their own versions of the florin. In the early 1600s, for example, because money was scarce in the American Colonies, the settlers used Dutch florins, English shillings, Spanish dollars, and French coins.

Translating 17th century prices in florins, or any early currency, is difficult, of course, because of changing price levels and monetary systems. Happily, a modern equivalent of 17th century Dutch tulip prices can be estimated because Mackay gave an example of a typical price paid for a single bulb of a species called the Vice-roy in which the price is measured in florins and in terms of

real goods received in trade. This example is shown in Table 1. Keep in mind that one single tulip bulb was received in trade for *all* the items listed in Table 1.

The first item received in trade is two lasts of wheat. A last is a unit of weight or cubic measure that typically equals 4,000 pounds but can vary by locality and by load.¹ Assuming that 4,000 pounds is indeed the correct weight and that a bushel of wheat weighs 60 pounds, then using the current price of \$3.30 a bushel for wheat produces the price of \$440 for two lasts of wheat shown in Table 1. Similarly, four lasts of rye at a current price of \$144.60 a ton are worth \$1,152.

Oxen were a valuable source of power in the agrarian economy of 17th century Holland. Today, oxen have been replaced by a different kind of animal, the John Deere tractor. The current value of four fat oxen might reasonably equal the cost of a modest farm tractor or a commensurate value of four fat beef animals—say, white-faced Herefords. Four Herefords are cheaper than a modest John Deere tractor and thus represent a conservative measure of the value represented by four fat

Table 1. Comparison Prices

Goods	Dutch 1635 Price (florins)	U.S. 1998 Price (dollars)
Two lasts of wheat	448	440
Four lasts of rye	558	1,152
Four fat oxen	480	3,476
Eight fat swine	240	1,134
Twelve fat sheep	120	702
Two hogsheds of wine	70	4,792
Four tons of beer	32	7,571
Two tons of butter	192	6,109
One thousand pounds of cheese	120	6,980
A complete bed	100	1,410
A suit of clothes	80	750
A silver drinking cup	60	68
Total	2,500	34,584

oxen. A typical weight of 1,100 pounds and an on-the-hoof price of \$0.79 a pound produces a conservative estimate of the value of four fat Herefords of \$3,476. Similarly, the value of eight fat (an average weight of 225 pounds) swine and an on-the-hoof price of \$0.63 a pound is \$1,134 and the value of the sheep (with an average weight of 65 pounds and an on-the-hoof price of \$0.90 a pound) is \$702.

A hogshead is a large barrel or cask. In the United States, a hogshead contains 63-140 gallons; in Great Britain, it contains 50-100 gallons. Taking 75 gallons as a reasonable average, two hogsheads represent 150 gallons of wine. As a proxy for the cost of a medium-grade table wine, consider the \$5.99 price for a 750-milliliter bottle of 1996 Fetzer Vineyards Sundial chardonnay (California). With a liter roughly equal to a quart and four quarts to the gallon, the present-day value of 150 gallons of wine is \$4,792.

The ton as a standard measure of dry weight equals 2,000 pounds in the United States and Canada (a short ton) and 2,240 pounds in Great Britain (a long ton).² Thus, two long tons of butter at a retail price of \$1.69 a pound has a value of \$7,571. Beer in 12 ounce cans weighs 22 pounds a case. Given a typical retail price for a popularly priced beer, Budweiser, of \$15 a case produces the price of \$6,109 for four tons of beer. A typical retail price for an 8-ounce brick of Kraft sharp cheddar cheese is \$3.49, so the present-day value of 1,000 pounds of cheese is roughly \$6,980.

The current values of a complete bed, a suit of clothes, and a silver drinking cup vary widely, of course, depending on personal preferences. For example, a typical retail price for a popular Serta Masterpiece Wor-

thington queen-size foundation and mattress is \$576. A frame usually runs \$59; a headboard and footboard, between \$400 and \$600. Sheets, pillows, pillow cases, and a comforter might run an additional \$275. So, using a midrange \$500 for the headboard/footboard, the present-day value of a complete bed would be roughly \$1,410. A moderately priced suit of clothes for business wear might run \$500-\$1,000, with a midrange of \$750. And finally, a moderately priced Alesandro drinking cup handmade of sterling silver has a typical retail price of \$68.

In summary, a representative calculation of the present-day price paid for a single Viceroy tulip bulb in 1635 near the height of tulipmania in Holland totals a whopping \$34,584. Therefore, Mackay's example of individual tulip bulbs fetching anywhere from 1,260 florins to 5,500 florins implies a present price range of \$17,430 to \$76,085 a bulb.³

The End of the Madness.

According to Mackay, by 1636, regular marts for the sale of tulip bulbs had been established on the Amsterdam Stock Exchange and in Rotterdam, Haarlem, Leyden, Hoorn, and other towns. Popular interest in tulips had shifted from hobbyists and collectors to stock jobbers, speculators, and gamblers. People from all walks of life liquidated homes and real estate at ridiculously low prices to garner funds for tulip speculation. Tulip notaries and clerks were appointed to record transactions; intricate public laws and regulations were developed to control the tulip trade.

Then, in the early autumn of 1636, some prudent investors began to liquidate their tulip holdings. Tulip prices began to

weaken, slowly at first and then more rapidly. Soon, confidence was destroyed and panic seized the market. Within six weeks, tulip prices had crashed by 90 percent or more. Defaults on purchase contracts and liens were widespread.

At first, the Dutch government refused to interfere; it advised tulip holders to agree among themselves to some plan for stabilizing tulip prices and restoring public credit. All such plans failed. After much bickering, assembled deputies in Amsterdam then agreed to declare null and void all contracts made at the height of the mania, or prior to November 1636. Tulip contracts made subsequent to that date were to be settled if buyers paid 10 percent of prices earlier agreed upon. This decision gave no satisfaction, however, because tulip prices continued to fall.

Next, the Provincial Council in the Hague was asked to invent some measure to stabilize tulip prices and public credit. Again, all efforts failed. Tulip prices fell even lower. In Amsterdam, judges unanimously refused to honor tulip contracts on the grounds that gambling debts were not debts in the eyes of the law. No court in Holland would enforce payment. Dutch tulip collectors, stock jobbers, speculators, and gamblers who held tulips at the time of the collapse were left to bear ruinous losses. Tulip prices soon plunged to less than the present equivalent of a dollar (or 10 guineas) each. Those lucky enough to have profited were allowed to keep their gains. Many of those who profited from the mania and the ensuing collapse apparently converted their gains into English or other funds to hide them from their enraged countrymen. Commerce in Holland suffered a

severe shock from which it did not recover for many years.

All subsequent stock jobber attempts to recreate tulipmania in Holland, England, and Paris proved fruitless. Although tulips are still more popular in Holland than elsewhere, tulip prices there have never again approached levels seen in 1634 through 1636. Today, according to Van Engelen's wholesale price list, serious horticulturists can buy rare "collections" of Emperor tulips, Mid-Season tulips, or Darwin Hybrid tulips at prices from \$0.30 to \$0.40 apiece, levels similar to postmania tulip prices in Holland.

Today's Tulip Bulbs

Popular accounts of tulip bulb pricing in Holland in the 1634-36 period use the word "mania" to describe the episode. *The World Book Dictionary* defines mania as a kind of insanity characterized by great excitement, extremes of joy or rage, and uncontrolled and often violent activity—a kind of craziness.⁴

In commenting on Mackay's book, noted Wall Street speculator Bernard M. Baruch (1932) wrote that "without due recognition of crowd-thinking (which often seems crowd-madness) our theories of economics leave much to be desired" (p. xiii). Given the foibles of human nature, Baruch offered no hope that manias would cease. He did note, however, that "popular recognition of them and their early symptoms should lighten and may even avoid their more harmful effects" (p. xiv).

Today, given the separation of time and space, we can safely characterize a tulip price of roughly \$35,000 as "crazy" and the behavior of certain anonymous persons who deal in such prices as crazy. Not only does the price fly in the face of historical tulip prices, but no living person has any financial or emo-

tional capital invested in the notion that paying \$35,000 for a tulip bulb might be wise.

We hesitate to call any popular behavior of known persons going on today crazy, but we can ask whether some stock jobbers (security analysts), speculators, and gamblers are devoting significant time and energy to justifying what may later be regarded as crazy prices. In retrospect, most would agree that the prices paid at market peaks for computer ("tronics") stocks, the Nifty Fifty stocks, oil stocks, gold, silver, Japanese stocks, and biotech stocks were extremely high. Were they crazy?

Consider as a possible, and thus sure to be controversial, example of tulipmania today the pricing of Internet/online service providers' stocks. Table 2 shows recent prices and market capitalizations for 20 well-known online companies. Also shown are conventional accounting data on the companies' sales, book values, and projected earnings. Most analysts would agree that, on the basis of these common measures, current valuations of these stocks are at least very high. Some would say the valuations are crazy, but others would dispute that notion. Indeed, because of the high degree of uncertainty about the sector's growth prospects, judging the reasonableness of these Internet/online company valuations is difficult.

For some insight into this matter, consider the current valuation of America Online (AOL), the "King of Cyberspace." With a capitalization of about \$17.5 billion, the market cap of AOL approaches the combined value of all the other widely followed cyberstars shown in Table 2. In the spring of 1998, Wall Street and the media were universally report-

ing a positive perspective on the implications for AOL of the recent transaction between AOL, CompuServe, and WorldCom. In fact, however, details of the agreement suggest that AOL is significantly overvalued.

According to AOL's press release, WorldCom paid \$1.2 billion for CompuServe. WorldCom, in turn, traded CompuServe's online services business plus \$175 million for AOL's subsidiary ANS Communications in a transaction valued at \$425 million. In other words, AOL traded assets with a net value of \$425 million - \$175 million = \$250 million for CompuServe's 2.6 million online customers. Thus, AOL's winning bid for CompuServe's online business was roughly \$250 million/2.6 million = \$96.15 per paying customer.

Given the arms-length nature of this transaction, we can assume that AOL was the top bidder for the CompuServe customer base. With economies of scale, we can also logically conclude that CompuServe customers were worth more to AOL than to other potential bidders, such as AT&T or Microsoft Corporation. Because AOL was a buyer and CompuServe was a seller, it is also reasonable to conclude that AOL saw more value in this customer base than did CompuServe. All of these considerations make AOL's price of \$96.15 per CompuServe customer an aggressive estimate of the private-market value of the CompuServe business.

In this context, how aggressive are investors in placing a \$17.5 billion market cap on AOL? With AOL's market-leading position, rapid revenue growth, and so on, AOL customers may be worth more than what AOL had to pay to snare CompuServe's business. They had better be.

Table 2. Online Stock Prices

Company	Price (6/04/98)	52-Week Low	52-Week High	Sales per Share ^a	Book Value per Share ^b	EPS ^c	1999 EPS Estimate	1999 P/E	Market Capitalization (millions)	Employees	Analyst Opinion
Amazon.com	\$ 43.875	\$ 8.250	\$ 50.000	\$ 4.84	\$0.41	-\$0.75	\$0.55	na	\$ 2,167.4	614	1.9
America Online	81.250	26.688	92.250	10.70	2.09	0.34	0.90	90.3	17,566.3	7,371	1.4
CNFT	32.938	19.313	46.500	2.64	2.42	1.25	0.68	48.4	490.8	581	2.0
CyberCash	15.125	10.125	27.750	0.50	1.96	-2.11	1.24	12.2	184.5	227	3.0
Data Broadcasting Corporation	5.938	4.250	9.125	2.74	2.99	0.08	na	na	201.9	701	na
DoubleClick	32.500	26.125	49.250	3.47	4.12	-1.04	-0.48	na	533.0	185	2.0
e-TRADF Group	22.000	17.375	47.875	5.05	7.39	0.52	0.90	24.4	858.0	499	1.6
EarthLink Network	58.500	10.000	77.000	8.77	0.54	-2.67	1.51	38.7	702.0	785	2.0
Excite	55.969	10.125	93.313	4.08	1.28	-1.84	0.91	61.5	1,309.7	434	2.2
At Home Corporation	34.625	16.625	47.000	0.12	0.93	-2.86	0.05	692.5	4,110.0	329	2.3
IDT Corporation	26.500	7.375	40.250	9.71	2.99	0.40	0.81	32.7	371.0	360	1.2
Infoseek Corporation	22.563	4.375	45.000	1.55	1.00	-0.82	0.28	80.6	697.2	171	2.4
Lycos	51.500	11.188	79.125	3.08	2.51	-5.91	0.16	321.9	803.4	137	1.8
Macklermedia Corporation	19.375	17.750	29.875	7.07	2.12	0.73	1.52	12.7	160.8	182	1.0
N2K	19.813	12.250	34.625	2.56	3.26	-6.22	-2.67	na	281.3	246	1.8
Netscape Communications	24.375	14.875	49.500	5.89	4.38	-1.29	0.39	62.5	2,400.9	2,310	2.6
Open Text Corporation	17.000	8.000	23.500	2.02	1.93	-0.57	0.65	26.2	299.2	295	1.5
PSINet	10.500	4.250	15.250	3.40	0.39	-1.58	-1.38	na	536.6	775	2.3
Spyglass	10.063	4.063	15.250	1.15	2.47	-1.31	0.08	125.8	131.8	162	2.0
Yahoo!	102.625	20.563	129.625	2.06	2.74	-0.45	0.74	138.7	4,751.5	386	2.0
Average	\$ 34.351	\$12.678	\$ 50.103	\$ 4.07	\$2.40	-\$1.43	\$0.29	119.7	\$ 1,927.9	838	1.9

na = not applicable.

Note: All data are from Yahoo! after the market close on March 27, 1998.

^aTrailing 12 months.^bMost recent quarter.^c1 = strong buy, 5 = strong sell.

To judge AOL's value, we need information on how many paying customers AOL has and what each is worth. Given multiple pricing plans and AOL's unwillingness to break out the number of its paying subscribers, that number must be estimated from company filings with the U.S. SEC. For the quarter ended December 31, 1997, the estimated average number of paying customers in North America was $\$483.2 / (\$17.43 \text{ per month} \times 3 \text{ months}) = 9.24 \text{ million}$.

Given the \$96.15 price per customer paid for CompuServe's online business and assuming AOL has 9.24 million full-rate-paying customers, the value of AOL's customer base would be only \$888.4 million, or \$4.11 per share (on 216.2 million [basic] shares). When compared with a private-market value of about \$4 per share, AOL's current stock price of \$81.25 seems at least very high. To justify such a price, analysts must regard AOL as having truly unusual future growth prospects. And other valuations in Table 2 raise similar questions. Are these analysts simply bullish, or are they crazy?

Conclusions

According to the efficient market

hypothesis (EMH), a stock price at any time reflects all relevant risk and return information. The implication is that near-term stock price changes are random and independent. In a rational pricing environment, investing in the stock market is a "fair game" in which the expected excess return for each security is zero. Taken literally, this characterization means that every stock at every point in time is an equally good buy (or sell).

At the same time, a large and growing body of literature on stock market anomalies suggests that unexplained systematic abnormal returns may reflect market inefficiency and/or elusive errors in expected return calculations (model misspecification). Fama and French (1996), among others, showed that average returns on common stocks are related to company characteristics—size, earnings to price, cash flow to price, book value to market value of the company's equity, past sales growth, long-term past returns, and short-term past returns. Fama and French argued that the perceived mispricing of such fundamental factors disappears in a three-factor model and that asset pricing appears rational within this framework.

On the other hand, Soros (1995), among others, has suggested that subtle psychological influences help explain certain anomalous pricing situations. In his words,

Classical economic theory assumes that market participants act on the basis of perfect knowledge. That assumption is false. The participants' perceptions influence the market in which they participate, but the market action also influences the participants' perceptions. They cannot obtain perfect knowledge of the market because their thinking is always affecting the market and the market is affecting their thinking. (p. 67)

Based on this assessment, the EMH is a "working hypothesis": Investors are *primarily* rational and *typically* price securities in a rational fashion, but outbreaks of crowd behavior, typified by "extraordinary popular delusions and madness," are a possibility.

I wish to thank Bill Beedles, Mike Ettredge, Jack Graham, and Christine Hauschel for their helpful suggestions.

Notes

1. Measurement definitions are taken from *The World Book Dictionary* (Chicago, IL: Scott Fetzer, 1994).
2. When used to measure liquids, a ton is sometimes measured by the volume of water a ship will displace at sea level. The volume of a long ton of seawater is 35 cubic feet.
3. As an interesting check on these numbers, consider that if each florin represented the buying power of 3.5 grains of gold (or about an eighth of an ounce), a Viceroy tulip bulb price of 2,500 florins would be roughly equivalent to 365 ounces of gold. With a current gold price of roughly \$280 an ounce, 2,500 florins trans-

lates into a present equivalent of about 5102,083 worth of gold. Measured in terms of gold, Mackay's Viceroy bulb price would have a current price ranging from \$51,450 to \$224,583. So, the present-day gold-equivalent tulip price exceeds the product-equivalent (or real) price calculated in Table 1. This outcome is consistent with a decline in the price of real goods over time and a generally rising standard of living.

4. Sometimes referred to as a "bipolar disorder," mania is a serious mental illness in which a person alternates between periods of severe depression and periods of intense joy. The

illness is also called manic-depressive illness or manic depression. Approximately 3 million people in the United States suffer from bipolar disorder. If treated inadequately, the illness can have tragic consequences, such as suicide.

During periods of depression, a person suffering from bipolar disorder may feel sad, anxious, irritable, hopeless, or unmotivated. Depressed patients may experience insomnia or excessive sleeping, decreased or increased appetite, weight loss or weight gain, slowing of thought and movement, and poor memory and concentration.

During periods of mania, a person may experience euphoria (indescribable happiness) or may alternate between euphoria and irritability. Manic patients sometimes behave inappropriately. For example, they may laugh uncontrollably at funerals. Periods of

mania are also characterized by increased energy, racing thoughts, increased rate of speech, decreased need for sleep, exaggerated sense of self-worth, and poor judgment. Treatment for the disorder includes drugs and psychotherapy (see the 1994 *World Book Encyclopedia*).

5. AOL's published membership number of 10 million exceeds this level, perhaps because of the growing prevalence of free memberships. With as many as 10 million paying subscribers, the private-market value of AOL would be \$4.45 per share.

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