

How Much is a Tulip Worth?

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How Much is a Tulip Worth?

Abstract: More than 350 years ago, a passion to possess beautiful tulip blossoms, sometimes called "The Tulipomania," took hold in Holland. As the mania increased, many persons were known to "invest" the present day equivalent of roughly \$35,000 in the purchase of a single tulip bulb. Silly as this particular mania now appears, current market prices for internet stocks suggest that extraordinary popular delusions and the madness of crowds may not be confined to the Dutch people of the 17th century.

KEY WORDS: Tulipomania, Holland, internet stocks.

How Much is a Tulip Worth?

To present-day investors, the tulip is nothing more, nothing less, than a lovely garden flower. They grow from bulbs with leaves and stems that range from 4 inches to over 30 inches tall. The tulip usually develops one large, bell-shaped flower at the tip of its stem. The flowers may be almost any solid color; some tulips have flowers with two colors. Some tulip flowers become streaked with other colors because of viral diseases that affect 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, Austria, from Constantinople, Turkey (now Istanbul), in the 1500's. The name tulip comes from a Turkish word meaning turban, because their 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 remains an important industry today. It is also important in the northwestern part of the United States. Billions of tulip bulbs are produced every year. Dutch growers produce nearly 2,000 varieties (see De Hertogh, 1994).

After the tulip was brought to Europe, it became the most fashionable flower in both England and Holland. Interest in the flower developed into a craze in Holland, called the "tulipomania," between 1634 and 1637. Individual bulbs sold for huge prices. While many present-day investors are vaguely familiar with this so-called tulipomania, it is not generally recognized just how high tulip prices became during this period and how destructive the mania had become by its conclusion.

A fascinating early account of Holland's tulipomania can be found in Charles Mackay's (1841) classic *Memoirs of Extraordinary Popular Delusions and the Madness of Crowds*. In that volume, Mackay relates details of the tulipomania along with his account of the Mississippi Scheme, the South-Sea bubble, the witch mania, the slow poisoners, and other popular manias. Mackay's 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" (Mackay, 1841, p. xvii). Mackay's underlying presumption is clearly that aberrant crowd behavior in the world of investing bears resemblance to aberrant crowd behavior in the noninvesting world.

The purpose of this paper is to document a present-day equivalent of a typical price paid for tulip bulbs in Holland during the height of the tulipomania. For some, such prices will be nothing more than an interesting historical artifact. For others, documenting the extremes of the Dutch Tulipomania will offer useful evidence on the occasional role played by noneconomic factors in asset pricing. Within this context, the current pricing of online/internet stocks may become relevant.

The Tulipomania

During the 1600s, the Netherlands was a major sea power, accounting for roughly one-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 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 Indians 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 city, and gave the Dutch one of the highest standards of living in the world (see Jan de Vries, 1994). 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 to Holland and Germany in 1559, 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 paid for simple tulip bulbs. Men became known to pay 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 profits.

Prices continued to rise until 1635 when persons were known to invest fortunes of as much as 100,000 florins in the purchase of forty tulip bulbs. Mackay himself cites examples of various tulip bulbs fetching anywhere from 1,260-5,500 florins each. Of course, lending present-day meaning to 17th century prices in florins, or to any early currency, is made difficult by changing price levels and monetary systems. The florin was a coin that originated from 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 1200's to the 1400's. 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 1500's. Many European countries, including the Netherlands, produced their own versions. In the early 1600s, money was scarce in the American Colonies, and Dutch florins, along with English shillings, Spanish dollars, and french coins all circulated here in America (see Doty, 1994).

Happily, a present-day equivalent of 17th century Dutch tulip prices can be estimated because Mackay gives an example of a typical price paid for a single bulb of a species called the *Viceroy*, where the price paid is measured both in terms of florins and in terms of real goods received in trade. This example, shown in Table 1, provides an opportunity to calculate a present-day equivalent price of the amount paid. Keep in mind throughout this example that one single tulip bulb was received in trade for *all* 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 in different localities and for different loads.¹ Let's assume that 4,000 pounds is indeed the correct weight, and that a bushel of wheat weighs 60 pounds, where the current price of wheat is roughly \$3.30 per bushel. This gives a price of \$440 for two lasts of wheat. Similarly, four lasts of rye at a price of \$144.60 per ton, given 2,000 pounds per ton, is worth \$1,152.

In 17th century Holland, Oxen were a valuable source of power in an agrarian economy. In present-day America, Oxen have been replaced by a different kind of animal, *John Deer*. To measure the current value in use of four fat oxen one might reasonably measure 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 Deer* tractor, and thus represent a conservative measure of the value represented by four fat oxen. With a typical weight of 1,100 pounds, and an on-the-hoof price of \$0.79 per pound, a conservative estimate of the value of four fat Herefords is \$3,476. Similarly, the value of eight fat swine with an average weight of 225 pounds, and a on-the-hoof price of \$0.63 per

pound, is \$1,134. The value of twelve fat sheep with an average weight of 65 pounds, and an on-the-hoof price of \$0.90 per pound, is \$702.

According to *The World Book Dictionary*, a hogshead is a large barrel or cask. In the United States, a hogshead contains from 63 to 140 gallons; in Great Britain it contains from 50 to 100 gallons.² Taking 75 gallons as a reasonable average, two Hogsheads represents 150 gallons of wine. As a proxy for the cost of a medium-grade table wine, consider the \$5.99 per bottle price for the 1996 *Fetzer Vineyards Sundial Chardonnay (California)*. Each bottle holds 750 milliliters, where each liter equals roughly one quart. Taking four quarts to the gallon, this gives \$4,792 as the present-day value of 150 gallons of wine.

Of course, a ton is a standard measure of weight, equal to 2,000 pounds (short ton) in the United States and Canada, and equal to 2,240 pounds (long ton) in Great Britain. Thus, two long tons of butter, at a retail price of \$1.69 per pound, has a value of \$7,571. Popularly-priced beer in 12 ounce cans, such as *Budweiser*, weighs 22 pounds per case. Given a typical retail price of \$15 per case, this gives a price of \$6,109 for four tons of beer.³ A typical retail price for an 8 ounce brick of *Kraft Sharp Cheddar* cheese is \$3.49. This means the present-day value of 1,000 pounds of cheese is roughly \$6,980.

The present-day value of a complete bed, a suit of clothes and a silver drinking cup can vary widely, depending upon personal preferences. For example, a typical retail price for a popular *Serta Masterpiece Worthington* queen-size foundation and mattress is \$576. A frame usually runs \$59, with a headboard and footboard costing anywhere between \$400 and \$600, say \$500. Sheets, pillows, pillow cases, and a comforter might run an additional \$275. This brings the present-day value of a complete bed to roughly \$1,410. A moderately-priced suit of clothes for a businessman or business woman might run \$500-\$1,000, say \$750. And finally, a moderately-priced hand-made *Alesandro* drinking cup made of sterling silver has a typical retail price of \$68.

In sum, a representative calculation of the present-day price paid for a single *Viceroy* tulip bulb during 1635, near the height of the tulipomania in Holland, totals a whopping \$34,584. Therefore, Mackay's example of individual tulip bulbs fetching anywhere from 1,260-5,500 florins implies a present-day price range from \$17,430 to \$76,085 each.⁴

Mackay (1841, p. 93) relates that interest in tulips grew so much that by 1636 regular marts for their sale were established on the Amsterdam Stock Exchange, in Rotterdam, Harlaem, Leyden, Alkmar, Hoorn, and other towns. Popular interest in tulips 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 in order 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.

It was during the early autumn of 1636 that the more prudent began to liquidate their tulip holdings. Tulip prices began to weaken, slowly at first, but then more rapidly. Soon, confidence was destroyed, and panic seized the market. Within six weeks, tulip prices crashed by 90% or more; widespread defaults on purchase contracts and liens were experienced. At first, the Dutch government refused to interfere and 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 agreed to declare null and void all contracts made at the height of the mania, or prior to the month of November, 1636. Tulip contracts made subsequent to that date were to be settled if buyers paid 10% of earlier upon prices. However, this decision gave no satisfaction as Tulip prices continued to fall, and the Provincial Council in the Hague was asked to invent some measure to stabilize tulip prices and public credit. Again, all such efforts failed. Tulip prices continued to crash even further. 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; those lucky enough to have profited were allowed to keep their gains. Tulip prices plunged to less than the present-day equivalent of one dollar each (or 10 guineas), and 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 enraged countrymen. Commerce in Holland suffered a severe shock from which it took many years to recover.

All subsequent stock-jobber attempts to recreate another tulipomania in Holland, England, and Paris proved fruitless. While tulips are still more popular in Holland than elsewhere, tulip prices have never again approached levels seen during the height of the tulipomania of 1634-1636. Today, serious horticulturists might buy rare "collections" of *Emperor Tulips*, *Mid-Season Tulips*, or *Darwin Hybrid Tulips* at prices from \$.30 to \$.40 each, or at levels similar to post-mania tulip prices in Holland.⁵

The Psychology of Manias

Mackay, like other popular accounts of tulip bulb pricing in Holland during the 1634-36 period, refers to the word "mania" when describing that episode. It is well-worth noting that mania is a kind of insanity characterized by great excitement, extremes of joy or rage, and uncontrolled and often violent activity.⁶ 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 also are 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 Dilsaver, 1994).

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

Today, it is safe to characterize a tulip price of roughly \$35,000 as "crazy." Not only is there the "proof" of historical tulip prices, no living persons have any financial or emotional capital invested in the notion that it can be wise to pay \$35,000 for a tulip bulb. While the separation of time and space make it safe to characterize the behavior of certain anonymous persons as acting "crazy" during the Dutch tulipomania, it is less safe to regard the currently popular behavior of known persons as "crazy." Still, it is plausible that present day stock-jobbers (security analysts), speculators and gamblers continue to devote significant time and energy to justify what may be later regarded as "crazy" prices. In retrospect, extreme prices appear to have been paid at various times in recent years for computer ("tronics") stocks, "nifty fifty" companies, oil stocks, gold, silver, Japanese stocks, and biotech companies. In retrospect, most would agree that the prices paid for such assets at market peaks were very "high;" many would continue to dispute the notion that such high prices were "crazy."

The Current Mania for Internet/Online Stocks

To cite a current, and therefore sure to be controversial, example, consider the pricing of internet/online stocks. Table 2 shows recent prices and market capitalizations for twenty well-known internet/online companies. Also shown are conventional accounting information concerning sales, book values, and projected earnings.⁷ When measured against popular benchmarks, most would agree that current valuations in this sector are at least "very high." Still, many would dispute the notion that such valuations are "crazy." Given the high degree of uncertainty regarding the sector's future growth prospects, it is indeed difficult to distinguish whether or not internet/online valuations are "crazy" or just "very high."

For some insight on this matter, consider the current valuation of America Online, Inc. (AOL), the "King of Cyberspace." With a capitalization of roughly \$14.5 billion, the market cap of AOL approaches the *combined* value of all the other widely followed cyberstars shown in Table 2. During recent months, Wall Street and the media have reported a universally positive perspective on the implications for AOL of the recent AOL/CompuServe/WorldCom transaction. In fact, details of the agreement suggest a significant amount of AOL overvaluation. According to AOL's press release information, WorldCom paid \$1.2 billion for CompuServe. In turn, WorldCom traded CompuServe's online services business *plus* \$175 million for AOL's ANS Communications, Inc., subsidiary in a transaction valued at \$425 million. This means that AOL traded assets with a net value of \$250 million (= \$425 million - \$175 million) for CompuServe's 2.6 million online customers. Thus, AOL's winning bid for CompuServe's online business was roughly \$96.15 per paying customer (= \$250 million/2.6 million).

Given the arms length nature of this transaction, one can assume that AOL was the top bidder for the CompuServe customer base. With economies of scale, it also seems logical to conclude that CompuServe customers were worth more to AOL than to other potential bidders, like ATT or Microsoft. 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. This all makes AOL's price of \$96.15 per CompuServe customer an aggressive estimate of the private market value of the CompuServe business.

Within this context, one might ask how aggressive investors are in placing an \$14.5 billion market cap on AOL. With a 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. Given the existence of multiple pricing plans, and because AOL is unwilling to break out the number of paying subscribers, AOL's number of paying subscribers must be estimated from company filings with the SEC. Based upon AOL figures for the most recent quarter (12/31/97), the estimated number of paying customers from North America is 9.24 million ($= \$483.2/(\$17.43 \text{ per mo.} \times 3 \text{ mo.})$) (AOL's published membership number of 10 million exceeded this level given the growing prevalence of free memberships.) 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 \$4.23 per share (on 210.2 million (basic) shares). When compared with a private market value of roughly \$4 per share, AOL's current stock price of \$69 seems at least "very high." To justify such a price, simply bullish or "crazy" analysts must regard AOL as having truly unusual future growth prospects. Similarly, other valuations shown in Table 2 might be regarded as either "very high" or simply "crazy."

Conclusions

According to the Efficient Market Hypothesis (EMH), current stock prices reflect all relevant risk and return information. This implies that near-term stock price changes are random and independent. In a rational pricing environment, investing in the stock market is a "fair game" where the expected excess return for each security is zero. Taken literally, this means that every stock at every point in time is an equally good buy (or sell).

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

On the other hand, George Soros, among others, suggests that subtle psychological influences can help explain certain anomalous pricing situations. In the words of George Soros (1995), "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."

Within this context, it becomes reasonable to regard the EMH as a "working hypothesis" regarding *primarily* rational investors that *typically* price securities in a rational fashion. However, history seems to suggest that outbreaks of crowd behavior, typified by "extraordinary popular delusions and madness," are occasionally observed in various markets.

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Footnotes

1. *The World Book Dictionary, Volume 2*, (Chicago, IL: Scott Fetzer, 1994), 1182.
2. *The World Book Dictionary, Volume 1*, (Chicago, IL: Scott Fetzer, 1994), 1007.
3. 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.
4. As an interesting check on these numbers, consider the fact that if each florin represented the buying power of 3.5 grains of gold (or about one-eighth ounce), then a *Viceroy* tulip bulb price of 2,500 florins would be roughly equivalent to 365 ounces of gold. With a present-day gold price of roughly \$280 per ounce, 2,500 florins translates into a present-day equivalent of roughly \$102,083 worth of gold. Measured in terms of gold, Mackay's example of individual tulip bulbs fetching anywhere from 1,260-5,500 florins translates into a present-day price range from \$51,450 to \$224,583. Note that the present-day gold-equivalent tulip prices exceed the product-equivalent (or "real") prices calculated in Table 1. This is consistent with a decline in the price of real goods over time, and a generally rising standard of living. Importantly, there is ample reason to believe that the price estimated in Table 1 is a conservative estimate of the present-day equivalent price paid for a single bulb at the height of Holland's Tulipomania.
5. See the Van Engelen, Inc., Wholesale Price List, 23 Tulip Drive, Bantam, CN 06750.
6. *The World Book Dictionary, Volume 2*, (Chicago, IL: Scott Fetzer, 1994), 1265.
7. All data are from Yahoo after the market close on 3/37/98. See:
<http://quote.yahoo.com/q?s=AMZN+AOL+CNWK+CYCH+DBCC+DCLK+EGRP+ELNK+XCIT+ATHM+IDTC+SEEK+LCOS+MECK+NTKI+NSCP+OTEXF+PSIX+SPYG+YHOO&d=v1>

Table 1
How Much is a Tulip Worth?

	Holland price 1635 (in florins)	USA price 1998 (in 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 Hogsheads of wine	70	4,792
Four tuns of beer	32	7,571
Two tuns 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	<u>60</u>	<u>68</u>
Total	2,500	\$34,584

Table 2. Online Stock Prices

Company	Ticker	Price (6/04/98)	52-week Low	52-week High	Sales (per share)	Book Value (per share)	1999 EPS Estimate	1999 EPS Estimate	1999 P/E	Market Capitalization (in millions)	Employees	Analyst Opinion
Amazon.com, Inc.	AMZN	\$43.875	\$8.250	\$50.000	\$4.84	\$0.41	(\$0.75)	(\$0.55)	NA	\$2,167.4	614	1.9
America Online	AOL	81.250	26.688	92.250	10.70	2.09	0.34	0.90	90.3	17,566.3	7,371	1.4
CNET Inc.	CNWK	32.938	19.313	46.500	2.64	2.42	-1.25	0.68	48.4	490.8	581	2.0
CyberCash Inc.	CYCH	15.125	10.125	27.750	0.50	1.96	-2.11	1.24	12.2	184.5	227	3.0
Data Broadcasting Corp.	DBCC	5.938	4.250	9.125	2.74	2.99	0.08	NA	NA	201.9	701	NA
DoubleClick, Inc.	DCLK	32.500	26.125	49.250	3.47	4.12	-1.04	-0.48	NA	533.0	185	2.0
e-TRADE Group, Inc.	EGRP	22.000	17.375	47.875	5.05	7.39	0.52	0.90	24.4	858.0	499	1.6
EarthLink Network, Inc.	ELNK	58.500	10.000	77.000	8.77	0.54	-2.67	1.51	38.7	702.0	785	2.0
Excite, Inc.	XCIT	55.969	10.125	93.313	4.08	1.28	-1.84	0.91	61.5	1,309.7	434	2.2
At Home Corp.	ATHM	34.625	16.625	47.000	0.12	0.93	-2.86	0.05	692.5	4,110.0	329	2.3
IDT Corp.	IDTC	26.500	7.375	40.250	9.71	2.99	0.40	0.81	32.7	371.0	360	1.2
Infoseek Corp.	SEEK	22.563	4.375	45.000	1.55	1.00	-0.82	0.28	80.6	697.2	171	2.4
Lycos Inc.	LCOS	51.500	11.188	79.125	3.08	2.51	-5.91	0.16	321.9	803.4	137	1.8
Mecklermedia Corp.	MECK	19.375	17.750	29.875	7.07	2.12	0.73	1.52	12.7	160.8	182	1.0
N2K Inc.	NTKI	19.813	12.250	34.625	2.56	3.26	-6.22	-2.67	NA	281.3	246	1.8
Netscape Communications	NSCP	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 Corp.	OTEXF	17.000	8.000	23.500	2.02	1.93	-0.57	0.65	26.2	299.2	295	1.5
PSINet Inc.	PSIX	10.500	4.250	15.250	3.40	0.39	-1.58	-1.38	NA	536.6	775	2.3
Spyglass, Inc.	SPYG	10.063	4.063	15.250	1.15	2.47	-1.31	0.08	125.8	131.8	162	2.0
Yahoo! Inc.	YHOO	102.625	20.563	129.625	2.06	2.74	-0.45	0.74	138.7	4,751.5	386	2.0
Average		34.352	12.678	50.103	4.07	2.40	-1.43	0.29	119.7	1,927.9	838	1.9

Note: All data are from Yahoo! after the market close on June 4, 1998.

a 1= strong buy, 5 = strong sell.