

# THINKING ABOUT CYPRESS STOCK

by T. J. Rodgers

## THE PROBLEM FOR SMALL INVESTORS

This is an analysis of the historical valuation of Cypress stock. It is not a recommended strategy for trading shares, although the method used to study stock valuation entails the use of hypothetical trading strategies carried out on actual Cypress historical stock price trends.

We have recently had an unprecedented number of calls from individual investors who bought Cypress shares near the all-time-high price of \$27.38 per share. Many of the investors ask, “The stock is down 50%; what’s wrong with the company?” Since Cypress met or exceeded Wall Street expectations for earnings per share in every quarter of 1995, the answer relates more to a stock market situation than to a performance problem. The intent of this analysis is to provide data and analytical methods to help shareholders better answer the following questions:

- Did I pay too high a price for Cypress when I purchased its shares at \$20-plus?
- If I choose to hold my shares, how long will I have to wait to break even?
- If I trade Cypress shares in the future, how will I know if the shares are high priced—or a bargain?

***No analysis can provide answers to questions that require a prediction of the future.***

However, we can analyze data for Cypress’s 2,515 trading days over the last ten years, and show typical trends for the pricing of Cypress stock, and for the time required historically for an investment to produce a capital gain. Shareholders should not expect that an historical analysis of share price data can be extended accurately into the future (the data itself shows

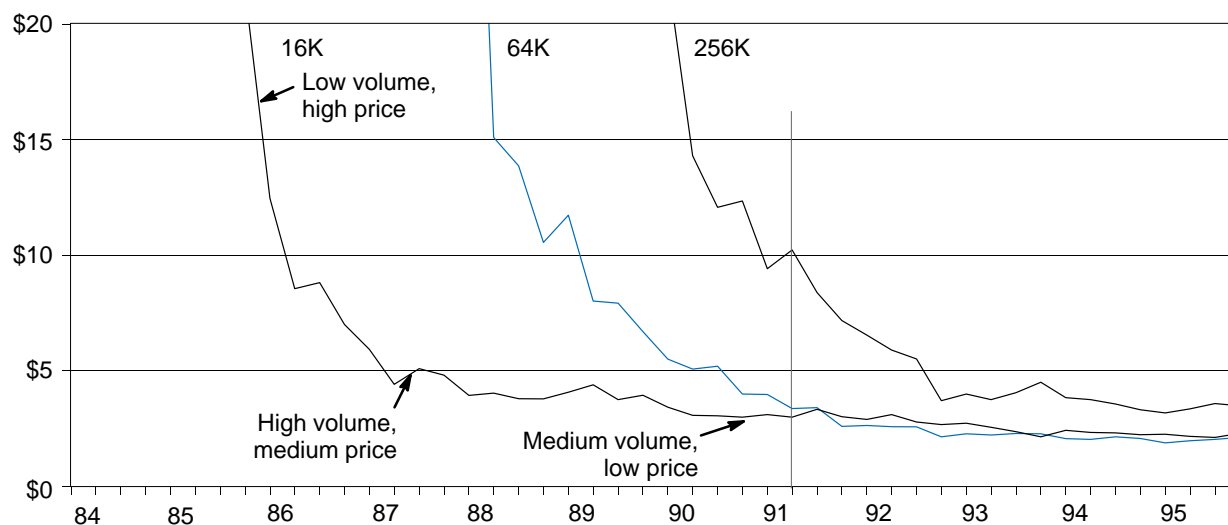
just that), but this ten-year analysis should provide useful added information for making trading decisions.

Semiconductor stock prices declined at the end of 1995 after analysts’ reports on softness in the semiconductor market. Cypress’s share price fell following a series of reports detailing the “crash” in prices of our highest volume product, the 256K-bit static RAM. Despite 47% revenue growth and 82% earnings growth in 1995, our P/E ratio fell to 8.3 at year-end. We believed that our shares had become undervalued, and decided to buy back \$70 million of stock with the express intent of reselling those shares at a higher price in the future to raise money for expansion. At year-end, many analysts advised investors to “hold” (usually a euphemism to sell) our shares—while Cypress was buying. Some of the pessimistic news about the semiconductor market was carried on financially oriented cable TV programs which are literally displayed in windows on the computer screens of some stock traders. The problem: How can a small investor who may always be late in reacting to the latest news on the spot-market price for the 256K static RAM hope to compete against institutional investors and stock traders with real-time television hook-ups?

## SEMICONDUCTOR ECONOMICS DEFIES COMMON SENSE

The prices for 256K static RAMs are currently falling—but static RAM price “crashes” have been a constant in our business since the static RAM’s invention in 1970. During this period of dramatic price reductions, the semiconductor industry has grown from \$2.6 billion in 1970 to \$144 billion in 1995. We can all appreciate how industry sales might grow during a period of dramatic price reductions, but what problem might that present to a company like Cypress, whose price for a 256K-bit static RAM might drop as much as 50% in 1996? (Consider the effect of an equivalent drop in car prices from \$20,000 to \$10,000 in one year.) The answer is that semiconductor companies routinely absorb

## Cypress Static RAM Average Selling Prices

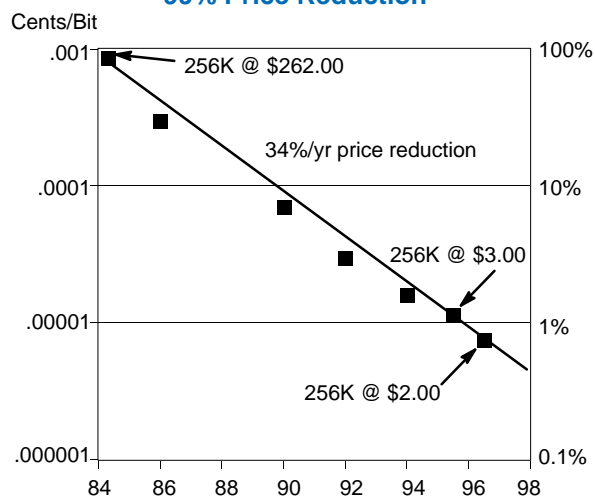


Although Static RAM prices are unpredictable over periods of a few quarters, over a multi-year timeframe, they have followed very predictable price reduction curves. Historically, after a period of high pricing, static RAM (SRAM) prices fall over a period of approximately four years to \$2. We expect the 256K SRAM price to follow this trend and fall from its current \$3 price to about \$2 in 1996. When a new static SRAM is first introduced, low volumes are initially shipped at high prices. After the price drops to approximately \$5, and there is not yet competition for the next-generation product, the SRAM peaks in revenue with high volumes shipping at medium prices. At the end of the product life cycle, when the bit-price of larger SRAMs is cheaper, the volume on a SRAM drops, and prices generally drop to the \$2 level. A change in the price of a given RAM in a given quarter may mislead an investor making a trading decision. For example, in the second quarter of 1991, analysts could have submitted conflicting reports that the price of 16K SRAMs was "in the mud," the price of 64K RAMs was "a new all-time low," but the price of 256K SRAMs was "high and rising." Should an investor buy or sell on that news?

significant price reductions with no long-term negative impact.

Price reductions measured in percent per year imply that exponential equations describe our industry's economics. Exponential equations are notoriously difficult to comprehend. Even slow exponential growth rates like that of population create counter-intuitive results, like this fact caused by exponential growth: "More people are living on earth today than the total number of people who have lived and died in all history." In an industry that is governed by the implausible outcomes of exponential mathematics, how should an investor make quick, rational decisions—especially if that investor's position is "under water" and the analysts are strapping on their life jackets?

## Static RAM Bit Pricing 99% Price Reduction



These data points show the price Cypress has charged for a bit of fast static RAM over time. During the 12 years from 1984 to 1996, Cypress cut SRAM bit pricing by over 99%! The price of 256K bits of static RAM dropped from \$262 in 1984 to \$3 in the fourth quarter of 1995 and will probably drop to about \$2 this year. Seemingly large changes, like the 33% price reduction from \$3 to \$2, are ordinary events in a business based on exponential "learning curves."

## DATA-DRIVEN DECISIONS: BUY LOW AND SELL HIGH

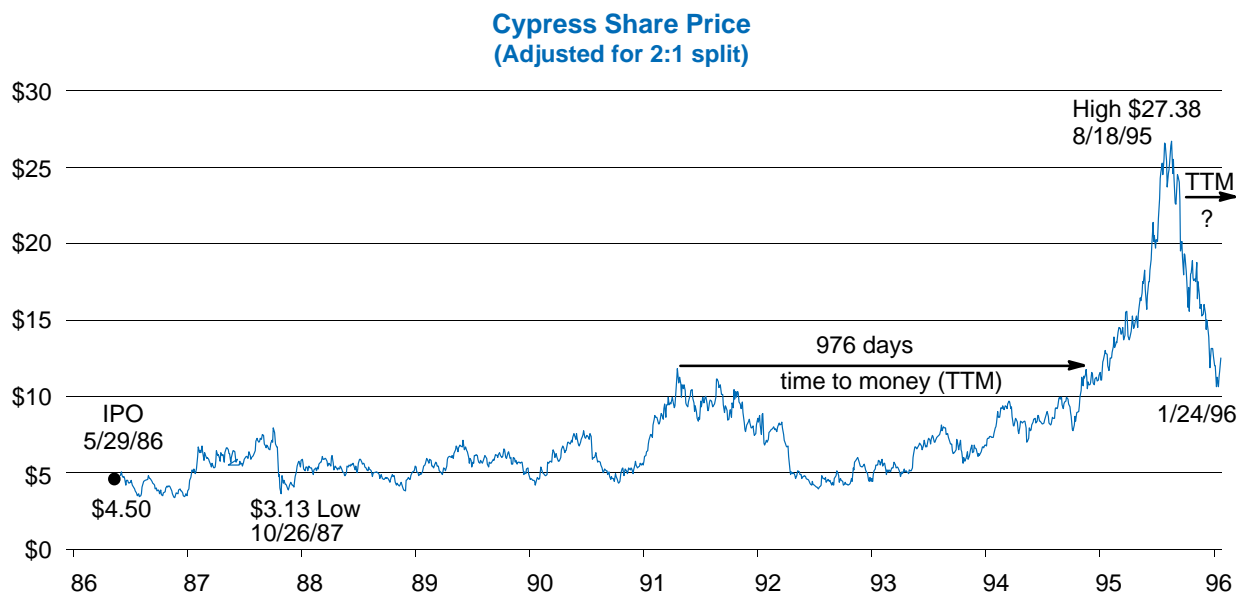
Cypress's share price has behaved like that of many good technology companies: up and down, but up over the long haul. Nonetheless, investors sometimes buy Cypress at an inopportune time, just before the share price drops—in many cases, exactly at a time when many analysts are pushing the “strong fundamentals” of Cypress and the semiconductor industry at large. So-called momentum investors “buy high” and hope for the stock to go higher. In some cases, that strategy traps investors into having to hold their shares for years before realizing a profit. Or, if the investor's patience or courage runs out, the momentum strategy may end up as a “buy high, sell low” strategy—a loser.

The strategy to buy low and sell high is, to use a phrase from GE's Jack Welch, “simple, but difficult.” “Buying low” often means going against analysts' warnings, and “selling high” often means selling into a bull market; in other words “buy low, sell high” often translates into “overcome fear, resist greed”—a very difficult task for investors or analysts.

## VALUATION METHOD

In the semiconductor business, our process yield—the number of chips we ship divided by the number of chips we start on our lines—can vary from 5% for a new product to 90% for a mature product. Our “learning curve,” the rapidity with which we move from 5% yield to 90% yield, separates winners and losers in our business. In the semiconductor struggle, we have learned to act more on what the data presents, and less on our instincts. This analysis of Cypress share price is based solely on data. The data is available to all investors: daily share price and Cypress's sales for the prior quarter. The analysis eschews the analysis du jour in favor of a statistical look at ten years of daily Cypress trading data. I use this model to help make Cypress's buy-back decisions, and my personal trading decisions.

The most common stock valuation method is the P/E ratio: the price per share, divided by analysts' forward-looking earnings per share estimates. The P/E ratio tends to fluctuate dramatically because it not only depends on predictions, but also on fluctuations in profitability. To reduce the volatility inherent in



This graph shows Cypress's daily closing price from its IPO at \$4.50 on 5/29/86 throughout the 2,515 trading days through 1/24/96. The low price was \$3.13 on 10/26/87 and the high price was \$27.38 on 8/18/95. Investors who entered the market at an inopportune time sometimes faced long periods with their shares “under water,” as long as 976 trading days (3.8 calendar years at 260 trading days per year). This analysis quantifies the conditions that can lead to a long time before a capital gain, or a long “time to money” (TTM), defined as the time newly purchased shares are “under water” before they turn to profitability. The TTM for some buys at recent high prices is not yet known.

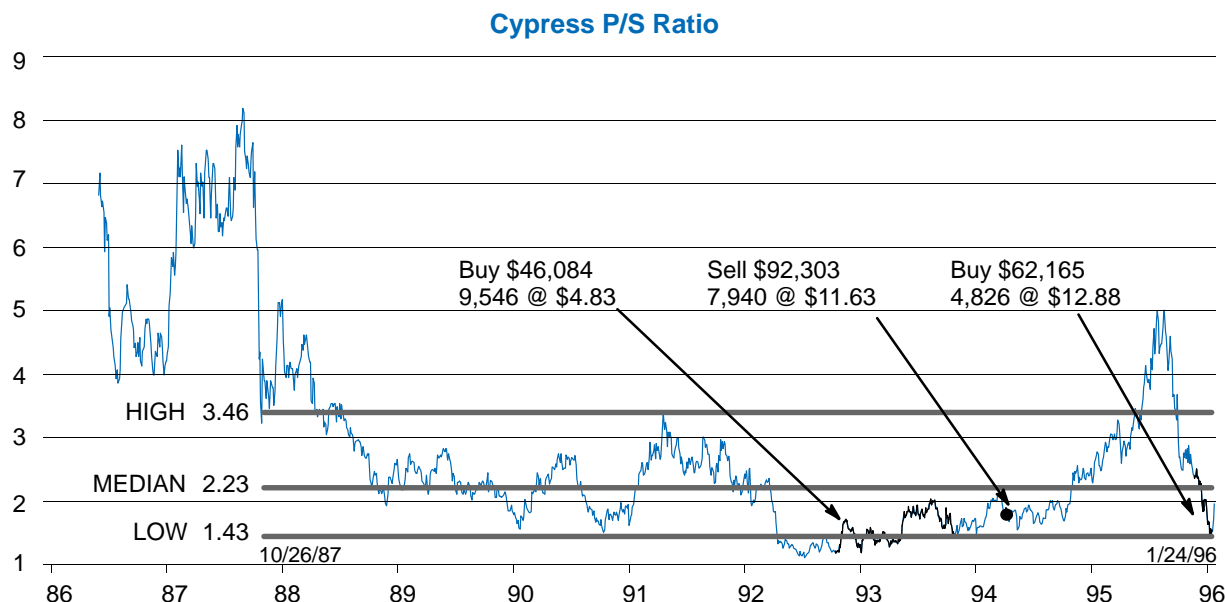
the P/E ratio, I have chosen for a valuation index the “P/S” ratio, the ratio of our price per share, divided by our annualized sales per share, where “annualized sales” equals four times the revenue of the last reported quarter. The P/S ratio also equals Cypress’s market capitalization divided by its sales. As defined, the P/S ratio needs no predictions, and can be calculated and trended by any investor.

$$\frac{P}{S} = \frac{\text{price/share}}{\text{annualized sales/share}} = \frac{\text{market capitalization}}{\text{annualized sales}}$$

Cypress’s daily P/S ratio for ten years appears below. Our P/S ratio dropped dramatically the week of “black Tuesday” in October 1987. Since that time, the P/S ratio has been relatively stable with a median value of 2.23, and 10th and 90th percentile points of 1.43 and 3.46, respectively. One can then say quantitatively, for example, that Cypress shares were relatively “low” whenever the P/S ratio was below 1.43, because on 90% of the 2148 trading days between 10/26/87 and 1/24/96, the share price was relatively more highly valued.

## BUYING LOW

The portion of the P/S curve from 1992 to 1993 highlights the period during which Cypress bought back about 10 million shares of its stock because—as we said to investors consistently at the time—we felt our shares were undervalued. We had just restructured after our only loss year in 1992, and we had a plan to improve in every quarter of 1993 and 1994. Analysts and investors did not believe in that plan, and our stock remained a great investment opportunity for us at less than \$5 per share. The dot on the P/S chart highlights the point at which we sold most of the buy-back shares at a substantial gain in our \$110 million convertible subordinated debenture offering. The proceeds were needed to fund Fab IV in Minnesota. In that sale, we did not follow the practice to “sell high,” based on the P/S ratio; we needed the funds for growth and simply took the gain presented to us at the time. The final highlighted section on the P/S graph in late 1995 represents our current \$70 million buy-back program—again at “buy low” prices. We are committed to the current



Cypress’s “P/S” ratio is the price per share of Cypress stock divided by the sales per share of Cypress stock, based on the annualized sales of the last reported quarter. Since October 1987, Cypress’s P/S ratio has been relatively stable, with a median value of 2.23, and 10th and 90th percentile points of 1.43 and 3.46, respectively. Cypress has bought back its own shares on two occasions when this P/S ratio was well below the median. The shares from the first buy-back were sold back into the market at a substantial capital gain to build Fab IV without added dilution to shareholders. Note that the P/S ratio before October 1987 was higher than it is now, and that an analysis made during that time would have been a poor predictor of the future. Big, unexpected changes like Black Tuesday can render historical analyses useless for prediction.

buy-back program because we believe in our future.

We believe:

- Total semiconductor sales will grow more in absolute dollars in the next 5 years than they have in all of the last 35 years (as do the majority of semiconductor analysts).
- Cypress can continue to meet its plan to grow faster than the market, as we have in nine of the last eleven years.
- Our buy-back program will therefore provide us with the funds for plant and equipment with less dilution.

Of course, the challenge for us is to turn our beliefs into reality.

The analysts generally believe:

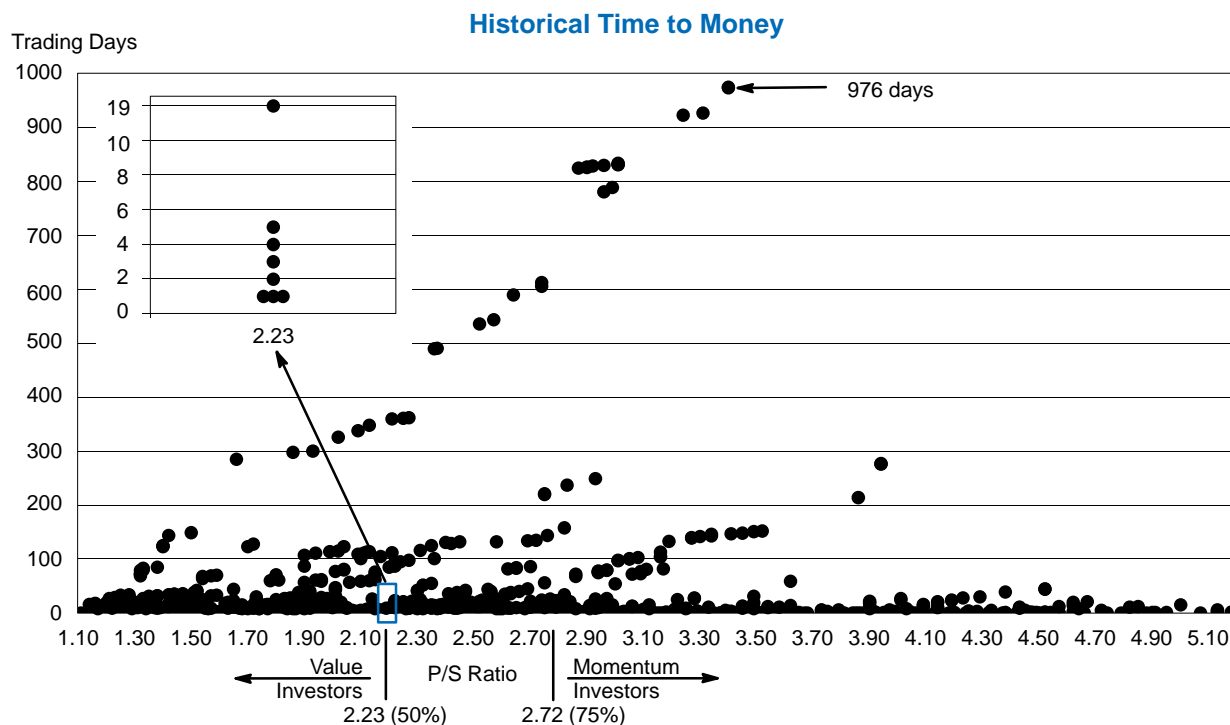
- The slow PC market at Christmas, and the problems it caused semiconductor companies, should be a sign of caution.

- There may be over-capacity in our static RAM market, and in the semiconductor market in general.
- Despite pervasive bullish five-year forecasts for the total semiconductor market, the worries and rumors surrounding the current market make investment unwise.

Consequently, many analysts have recommended to “hold” our shares recently, which means, we believe, to “sell low.” Cypress is acting on the reverse strategy to “buy low,” based on our plans for the future and an analysis of our share price history.

## SELLING HIGH: HAL, THE INVESTOR

The time it takes to make the first incremental gain on an investment in Cypress’s shares may be referred to as the “time to money,” or TTM. The time to money for every Cypress trading day is graphed below as a function of the P/S ratio. The insert explains the graph: for buyers who bought Cypress on one of the 8 days in the last eight years when the P/S ratio was 2.23, 3



This graph shows the time to money for purchases for 2122 trading days in the analysis as a function of the P/S ratio on the day of purchase. (The time to money for the other 26 days is not yet known.) The inset shows graphically the time to money for all purchases made on trading days when the P/S ratio was 2.23. The complete graph shows that although most trades yielded a short time to money, there was a significant possibility of a very long time to money for purchases made above the median P/S value of 2.23. The longest time to money of 976 days occurred for buyers who bought Cypress shares at a very high P/S ratio of 3.40.

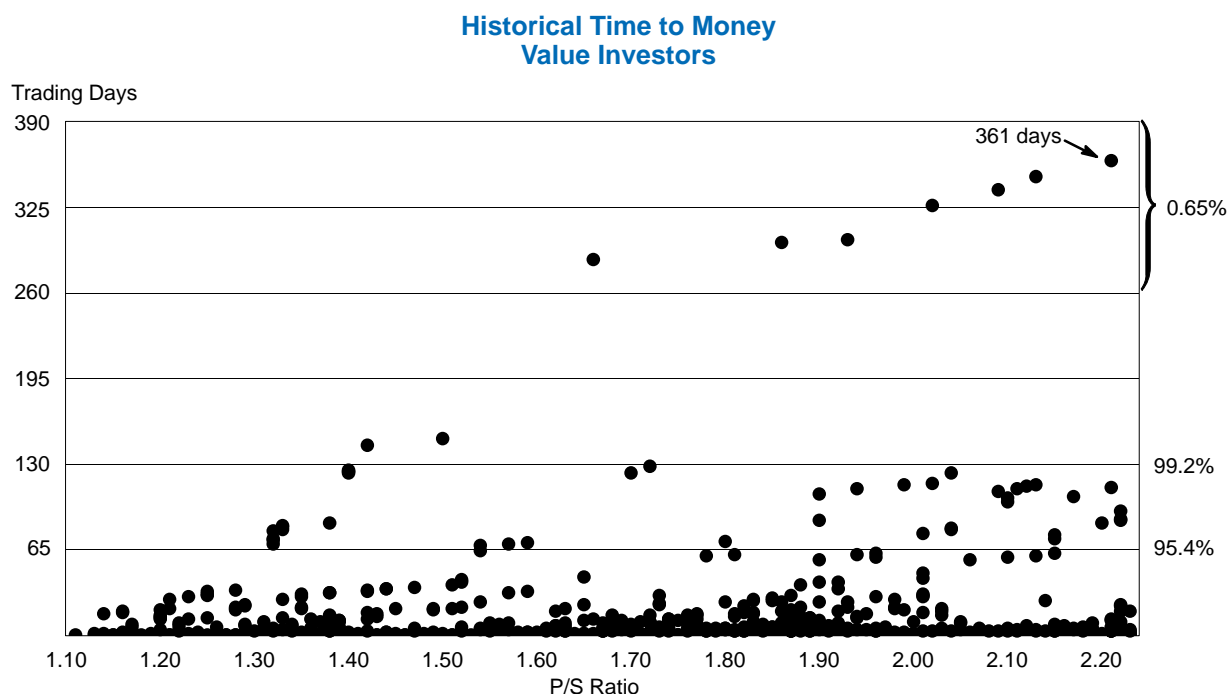
saw the stock go up the next day, 1 saw the stock go up in two days, and the least fortunate investor waited for 19 days until the stock closed above its purchase price. The complete graph, therefore, represents the time to money for every trading day, sorted by P/S ratio. The time to money has consistently been below 30 days, but waits of hundreds of days for a capital gain have occurred. Long TTM times were more likely to happen to investors who bought at a high P/S ratio; i.e., for momentum investors.

On the other hand, buyers who bought low, as defined by a P/S ratio equal to or less than the median of 2.23 or less, achieved a time to money of 130 trading days or less with a 99.2% probability, as shown below. The future cannot always be predicted from history. For example, using the P/S ratio trends from May 1986 to October 1987 (before the steep decline on the P/S ratio graph) would not have been good investment predictors after October 1987. But after that point and through January 1996, the P/S ratio was reasonably stable, and simple investment rules would have been effective in

making trading decisions. The algorithmic trading rules outlined below probably would have been preferable to momentum investing during the period of the study for the small investor who was unable to react quickly to semiconductor news and rumors on “the street.”

We named our computer HAL, and programmed him to make trades in Cypress shares according to our predetermined rules over an 8.3-year period from 10/26/87 to the most recent trading day in this analysis, 1/24/96. For the first simulation, we gave HAL these instructions:

- Start with \$100,
- invest the cash at 5% money market,
- buy low: put all cash into the market for  $P/S \leq 1.43$  (10th percentile),
- sell high: put all cash back into the money market for  $P/S \geq 3.46$  (90th percentile),
- pay \$0.10 for each share traded,
- calculate annual return based on combined trading gains and money market returns,



For those investors who bought low, when the share price was below the median P/S ratio of 2.23, there was 95.4% chance over the eight-year period analyzed that profit could be achieved in one quarter or less (65 trading days). There was a 99.2% probability of achieving a gain within two quarters. Only 0.65% of the buys resulted in a time to money of over one year, and in no case was the time greater than 18 months.



- but do not count the last trade if a sell transaction is pending. (This rule gave roughly equivalent results to a forced sell on the last day of the study.)

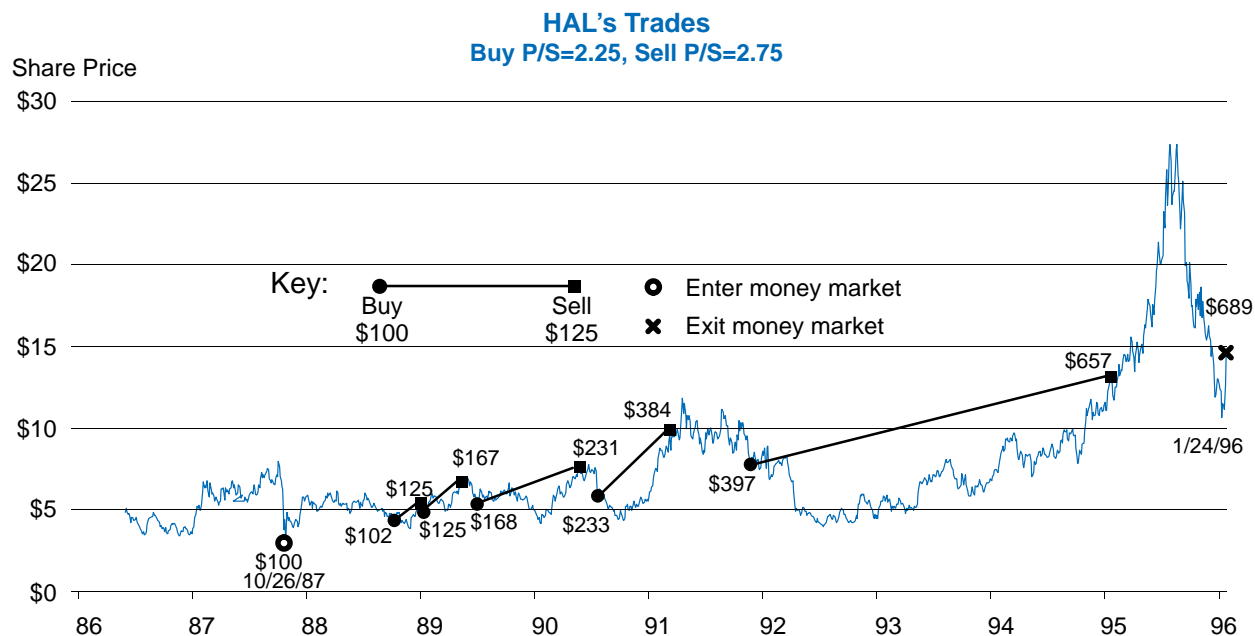
With these instructions, HAL made only two trades in eight years:

Action	Date	Share Price	# Shares	Value
Deposit	10/26/87	\$ 3.13	—	\$100.00
Withdraw	4/13/92	\$ 5.19	—	\$124.25
Buy	4/13/92	\$ 5.19	23.5	\$121.91
Sell	5/23/95	\$18.250	23.5	\$426.53
Deposit	5/23/95	\$18.250	—	\$426.53
Withdraw	1/24/96	\$14.375	—	\$440.29

That trade provided a 49.7% per year capital gain over the holding period, and a 19.7% annualized capital gain over the eight-year period, when blended with the 5% money market rate. The capital gain was great, but few investors would want to follow a strategy that required watching a stock for more

than four years before investing for the first time. The computer then ran approximately 1,000 scenarios for rules-based investment identical to the one above, but with different buy/sell criteria.

One successful rules-based strategy was to “buy below average” and “sell above average.” That strategy was designed to buy any time the shares were below the 50th percentile point of  $P/S = 2.23$ , and to sell at some higher  $P/S$  ratio. The graph below shows HAL’s actual trades for the Buy  $P/S=2.25$ , Sell  $P/S=2.75$  strategy, which yielded a 26.4% per year gain by making five high-gain trades in eight years. The table on the next page shows that the average “buy below/sell above average” strategy worked for a wide variety of cases to produce an annual return of approximately 25%. During the same 10/26/87 – 1/24/96 time frame, the most favorable “buy and hold” strategy, which allowed for purchasing shares at the all-time low price of \$3.13, yielded 19.7% per year, while the S & P 500 index appreciated 12.9% per year.



HAL made five buy-sell transactions when instructed to buy at a  $P/S \leq 2.25$  and sell at a  $P/S \geq 2.75$ . He waited for a year before he started to invest, then consummated four relatively quick trades to take his bank from \$102 to \$384. His final investment took over 3 years to pay off, and was “under water” for 1½ years. The bank on 1/24/96 was \$689.23, netting a 26.4% annual gain over 8.3 years. Simply buying \$100 of Cypress stock on 10/26/87 and holding it continuously to the end of the simulation would have yielded a bank of only \$442.64 and an annual gain of 19.7%. The trading strategy would have been superior to the buy-and-hold strategy, even for investors who bought on 10/26/87, Cypress’s all-time low. During the same 10/26/87–1/24/96 period, the S&P 500 index increased from 227.67 to 619.96, or 12.9% per year.

### Statistics for the “Buy Below Average/Sell Above Average” Trading Strategy

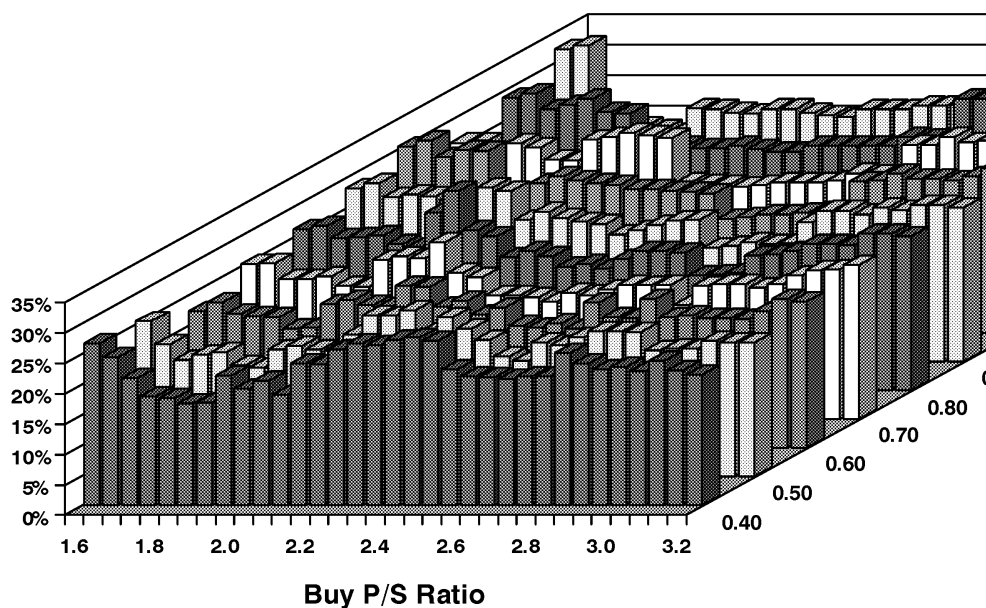
Buy P/S	Sell P/S	# Trades	\$ @ End	Annual Return	Days in Market		TTM
					Average	Longest	
2.25	2.75	10	\$689.23	26.4%	274	828	361
2.25	2.65	12	\$655.86	25.7%	221	825	361
2.25	2.55	14	\$653.28	25.6%	177	737	307
2.25	2.45	22	\$692.51	26.5%	107	728	307
2.25	2.35	34	\$539.79	22.7%	66	682	360

Five simulations were performed on Cypress's historical share price data in which HAL bought Cypress shares any time they were priced below a P/S ratio of 2.25 (near the median of 2.23). In the simulations, HAL sold the shares at various Sell P/S ratios higher than the Buy P/S ratio by 0.5, 0.4, 0.3, 0.2 and 0.1. The 2.25/2.75 strategy represented a “large capital gain” strategy demanding a 22.2% gain or more per trade. The 2.25/2.35 strategy called for a quick profit—to sell when the capital gain on a trade was as low as only 4.4%. As the required capital gain increased: 1) the annual return remained roughly constant at about 25%, 2) the number of trades went down dramatically, 3) the average time in the market for each trade increased dramatically, but 5) the time to money (TTM, the longest period for which the stock was “under water”) remained almost constant. In these simulations, the hypothetical investors had to wait for the TTM time indicated in order to achieve the annual return indicated. Any hypothetical investor who was not willing to wait for the TTM time would have sold shares at a loss in at least one of the trades in the simulation. In the simulations above, investors who would not have been prepared to hold as long as 361 trading days should not have invested in Cypress stock.

A second set of simulations showed that a strategy to buy low and sell high would have yielded a reasonable gain over a very wide variety of buy and sell points in the middle of the P/S range. HAL ran 330 simulations with the Buy P/S between 1.6 and 3.2, and the Sell P/S ratio higher than the Buy P/S ratio by 0.4 to 1.75.

These were large-gain scenarios with the capital gain per trade ranging from more than 10% to over 100%. The total range of annual return figures for these widely varying strategies was stable, with a minimum gain of 16.8%, a maximum gain of 33.0%, and an average gain of 23.7%. These yields are graphed below.

### Annual Return for 330 Simulations



HAL ran 330 different hypothetical historical investment scenarios. Shares were purchased at Buy P/S ratios ranging from 1.60 to 3.20. The shares were sold at the Buy P/S plus a P/S gain of 0.4 to 1.75. The best scenario produced a 33.0% annual return; the worst, a 16.8% annual return. The average of all 330 simulations was an annual return of 23.7%. Buy P/S ratios in the 1.60–2.25 range resulted in a worst-case time “under water” of 2 to 361 trading days. Although the return was comparable, Buy P/S ratios in the 2.30–3.20 range lengthened TTM times to as long as 781 trading days, or as much as 3 years “under water.”



No one can predict the future, but investors should at least consider that in following analysts' advice, they may sometimes be making the "buy high" mistake when they are purchasing our shares. Investors should also be prepared to hold our shares for an appropriate TTM time to avoid having to sell shares at a loss.

For investors who cannot react rapidly to Wall Street news and rumors, and who are prepared to hold shares for 300-plus days, a simple rules-based "buy low, sell high" trading strategy might be superior to the strategy of reacting real-time to the counter-intuitive and erratic semiconductor market. At a minimum, the analysis presented here provides an independent check on trading decisions.

The author is indebted to Jeff Arenberg and Kevin Murphy for their competent technical support.

This article is not intended to make any projection or forecast with respect to the semiconductor industry, Cypress's business or financial results or the value or trading prices of Cypress Common Stock. However, to the extent this article and its hypothesis contain forward-looking information, readers should be advised that actual results and outcomes may differ materially. There are numerous factors that will and can affect Cypress's business and the trading prices of its Common Stock, such as continued market demand for its products, competitive conditions, the general conditions which can affect trading in the U.S. capital markets, Cypress's overall financial performance, as well as many of the factors which are cited in the body of the article. This article is intended to set forth a hypothesis and an analysis and should be utilized, if at all, only in that light.