

## 5 The Golden Bit

In every cycle there is some industry whose stocks do not just rise; they go up 500, 700 percent. In the early sixties, these were the airlines: Northwest, Braniff, Delta, all went up 600, 800 percent. You don't have to hit a play like that more than once or twice in a lifetime. Figure it out.

. . . Back in the fifties . . . the Russians put up a Sputnik and Joe Alsop discovered the missile gap, and all of a sudden any company that could make an instrument or components for a computer or an exotic fuel was a lovely, nubile thing.

When I think of those stocks now they are like the faces of girls we once took to football weekends. General Transistor, where are you now?\*

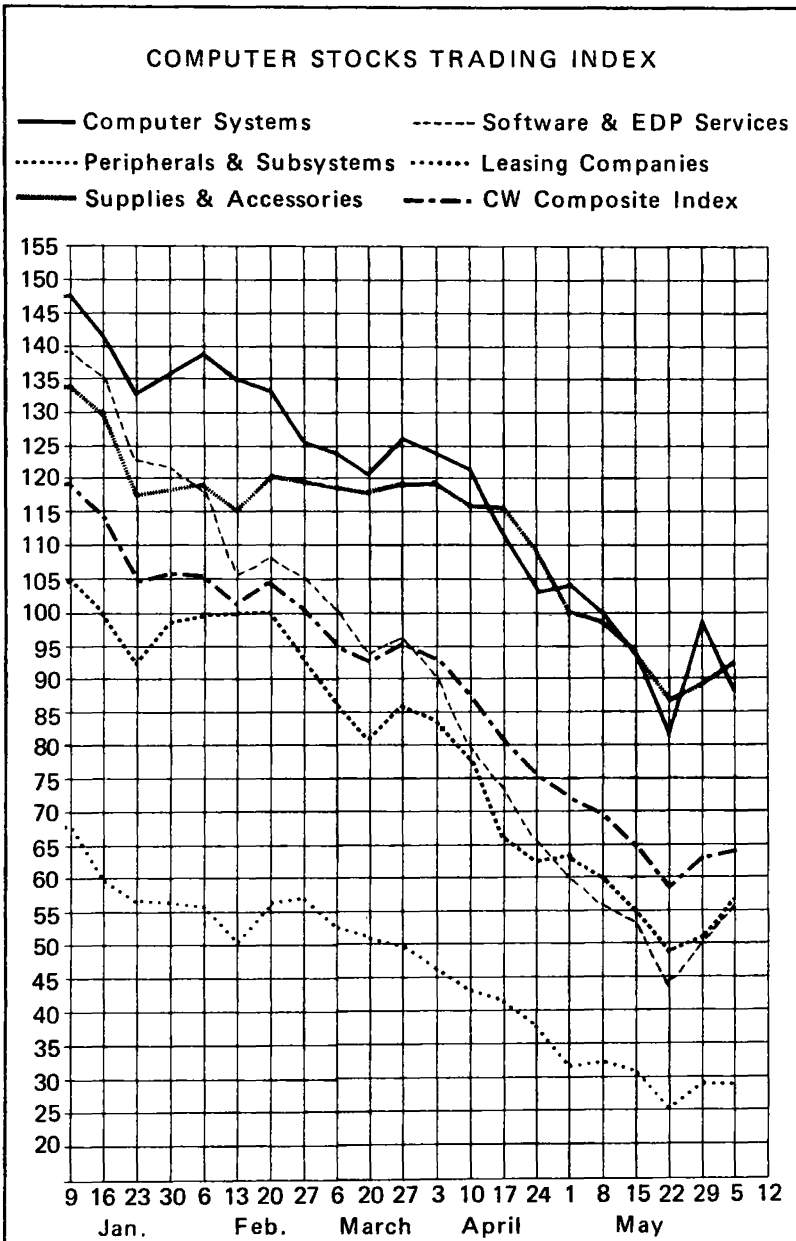
'Adam Smith'

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The computer industry can be roughly segmented into five subdivisions: computer systems, peripherals and subsystems, supplies and accessories, software, and leasing. To watch the performance, on the stock market, of one of these segments is to know them all. For example, Fig. 1. (taken from *Computerworld*, June 10, 1970) shows the average stock prices for the five segments, all showing surprising synchronization as they take the toboggan ride down during the first half of 1970.

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\* From *The Money Game* by 'Adam Smith'. Copyright © 1967, 1968 by 'Adam Smith.' © 1966, 1967 by *World Journal Tribune*, Inc. Reprinted by permission.



Base for each trading index: 100 as of 3/1/68

FIGURE 1 A study in synchronization: five segments of the computer industry during a notable quarter in their history, the first part of 1970. (From *Computerworld*, June 10, 1970.) Copyright by *Computerworld*, Newton, Mass. Reproduced by permission.

During the nineteen sixties the pace, vigor, and expansion of the computer industry gave it a golden glow. In the minds of investors and traders alike, the prospective market for data processing products seemed a thing of limitless promise—even though the war in Southeast Asia gave clear-cut evidence of an ominous pathology in government, from which a damaged economy must inevitably follow. The period 1969/1970 showed that even the strongest element—the computer industry—of the commercial spectrum can be badly dimmed when the economy is sick. Figure 1 shows what happened on the average, when the Big Board tilted and the prices slid down, but the kinetics of the individual member can be fairly understood from the neat characterization of the day (September 27, 1966) “they red-dogged Motorola,” by ‘Adam Smith’.

“They’re out,” Charley says. “They can’t go to the Fed because the Fed will slam the window on their fingers if they look at their loans, so they have been scrambling around Europe sopping up Eurodollars.”

If you understand what Charley said, fine, and if you don’t, it doesn’t have much to do with Motorola except that it sets a nice, dark, ominous atmosphere. Money is tight and Wall Street doesn’t like the Vietnam war at all. Then a fellow we both know comes by and says Motorola is getting red-dogged down on the floor of the Exchange. Already there is a little crowd around the Dow-Jones broad tape in the anteroom where the carpet is worn.

Meanwhile, a couple of blocks away at 15 William Street the boys are spilling what is left of the tuna fish in order to get to the phones. All this from a speech by Mr. Robert W. Galvin from Franklin Park, Illinois.

Mr. Galvin is chairman of the board of Motorola, one of the flyers of the time, and he is addressing the sage and august New York Society of Security Analysts. Motorola, as you know, makes color TV sets, and that’s growth, and semiconductors, and that’s growth, and two-way radios, and that’s growth. Growth, growth, growth.

Six months ago all this growth is worth \$234 a share. On September 27 it’s worth \$140. A bad gassing, but how much worse can things be? They’ve going to earn \$8 a share. It says so in Standard & Poor’s. Business, Mr. Galvin says, is so good, it’s bad. They have all the orders they can handle, they just have trouble producing the goods—shortages here, labor problems there. They can sell all the color TVs they can make, they

just can't make them fast enough. Earnings will be up—but to \$5.50, \$6 on the outside. Everything else is rosy.

The sage and august analysts look at each other for a moment: \$6? \$6? What happened to the other \$2?

Then it's like the end of the White House news conference, except nobody has even said, "Thank you, Mr. President." They're all running for the phones. Except they are security analysts, not newsmen, so they use the Olympic heel-and-toe walk instead of the outright sprint. There is a question-and-answer period, but Mr. Galvin's audience has been depleted.

. . . We stand there watching the tape, and there goes MOT, 137, 136, oof, 134. Big blocks are appearing.

. . . Now down on the floor the pressure is on the specialist. He is standing there on the floor at Post 18, his Hippocratic oath bidding him make an orderly market in Motorola, and suddenly there he is, like an adolescent fantasy, a quarterback in Yankee Stadium with the crowd roaring. Only it's the wrong dream. The crowd is roaring because all his receivers are covered, his defense has evaporated, and the red-dog is on:

two tons of beef descending on him, tackles grunting and linebackers growling *Kiiiiii*. Nothing to do but buckle, eat the ball, and hope you're still alive when they stop blowing the whistle.

Guys are bearing down on the specialist and he can tell that if he bends over in a reflex from the first chunk of Motorola that hits him in the stomach, they will hit him over the head with the rest. That's not an orderly market.

So they blow the whistle. No more trading in Motorola.

. . . At 3:29 the specialist reopened Motorola, just as the bell rang. That's like a boxer that manages to get on one knee just as the referee counts ten. Motorola reopened and closed at 119, down 19 on the day. In the marketplace it was worth \$114 million less at 3:30 than it was at 10:00 AM, and, say, \$684 million less than it had been a few months before. And it was the same company, more or less, and this year is better than last year and next will be better than this year.

Despite the importance of semiconductors to the computer industry, Motorola might be said to be on the edge of the boundary of the industry. The Control Data Corporation, on the other hand, is solidly in the interior. CDC was formed in 1957 by a group who left Remington-Rand,

armed with a good design for a transistorized computer and excellent prospects in the market. Their first machine, the 1604, was ready by 1960 and sold well to universities and some government agencies. A more powerful model, the 3600, was ready by 1963, and within a year later, the even more powerful 6000 series was being readied for sale. By 1966 CDC had a large piece of the market for big computer systems. The value of CDC stock climbed from \$25, at the end of 1966, to \$160, during 1967, and swung between \$125 and \$150 during most of 1968 and 1969.

During 1969 the money situation tightened ominously and buyers for large-scale computer systems tended to cancel orders or to request postponement of deliveries. Just as in the case of Motorola, three years earlier, CDC's troubles began with its earnings report at the end of September: third quarter profits, at 83¢ per share, were up 17 percent over the year before but somewhat lower than the expected dollar per share. Two blocks, amounting to 228,000 shares, were dumped at \$140 per share, more than five points under the close of the preceding day. By the end of the trading session that day, CDC had dropped another fifteen points. By the end of the week the stock was down to \$116.

The Federal Reserve Board severely administered a tight money policy through 1969 and 1970—until shortly before the elections—as part of a strategy of trying to contain a steadily increasing inflation. During that period, Control Data stock drifted down to a low, in summer 1970, of about \$30.

Shortly before the elections, 1970, the Federal Reserve Board, in response perhaps to some mystic incantation, reversed its policy and began feeding currency into the economy at a sizable rate. The effect on the computer stocks was a sudden and dizzying climb. IBM went from \$230 to \$310, CDC went from \$32 to \$54, Burroughs from \$87 to \$126.\*

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\* In the glow of this economic resonance, Robert W. Sarnoff, then chairman and president of RCA Corporation, announced on September 15, 1970, that his company was introducing a new line of computers which was intended to make RCA second only to IBM as a major computer manufacturer. But a year later (on September 17, 1971), Mr. Sarnoff announced that RCA had decided to drop

Irrespective of what was to come later, the spurt up continued until the beginning of October, when the Administration gave the details of what had been heralded as a “bold new peace plan” for Southeast Asia. The sage and august analysts mulled over the details: bold? new? The climb upward snapped to a standstill and for several months stock prices wavered erratically. But the Federal Reserve was now dedicated to flooding the economy with money,\* and by Spring 1971 interest rates were falling toward normal levels and stock prices were generally floating higher.

It might be said that Control Data was a particularly vulnerable company, given the state of the economy 1969/1970, since it dealt with large-scale machines and lacked the financial strength to lease (as did IBM) rather than sell, when buyers evaporated from the market. According to this view, producers of mini-computers should have been a lot better off than was CDC. (In fact, almost everyone was better off than CDC.)

The biggest American producer of mini-computers is the Digital Equipment Company. A mini-computer is a machine that costs anywhere from a few thousand to perhaps \$200,000. (The price could be pushed up to \$500,000 by embedding the computer in a big enough system.) DEC produces a variety of small machines which span this price spectrum. When the economy is slack and interest rates are edging up toward 10 percent, it is reasonable to suppose that an institution or corporation in need of in-house computing power might hesitate to buy a system in the \$2,000,000 to \$5,000,000 range, yet be willing to go one-tenth that

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out of the competition and would write-off the operation in the same year. The *Wall Street Journal* estimated that the loss, before taxes, might approach \$500 million and thus make it the most memorable incident in the history of commercial *contre-temps*.

\* H. E. Heinemann, in the *New York Times* of June 6, 1971, reported that the rate of increase in the money supply was the largest since 1950, and he quoted the *Monthly Economic Letter* of the First National City Bank as saying that the Federal Reserve Board was “in imminent danger of putting the economy back on the roller coaster.” (There may be those, among Mr. Heinemann’s readers, who, having seen IBM (over the preceding six weeks) drop from about 360 to about 310, felt that the economy had never really left the roller coaster.)

cost. So what did DEC do while CDC was probing for new depths during 1969/1970? DEC did some probing of its own. DEC started off in 1966 at about \$10 per share, climbed fairly steadily until it reached a peak of about \$120 per share in February 1970, and then took the roller coaster down to about \$50 per share. (Thereafter it performed some interesting oscillations between \$50 and \$80 per share.)

It might be claimed that, while computer manufacturers (mini- or otherwise) could not be expected to do much better than did CDC or DEC (unless they had large reserves of capital as does IBM), one might expect that the situation would be somewhat less difficult for the companies that produce the peripheral equipment—tape drives, disc drives, printers, readers, teletypes—for computers. Since many computer installations tend to be I/O bound (since most computing takes place much, much faster than the linked input/output), any advances in the technology of the devices or the materials that would increase I/O efficiency are quite valuable. One of the more notable companies in this area of the industry is Memorex. Memorex started off in 1965 at about \$10 per share and climbed fairly steadily to a peak of about \$170 per share by November 1969. But the record of Memorex on the New York Stock Exchange, thereafter, is curiously erratic. With respect to one of its breathtaking descents, Richard Ney, in his caustic criticism\* of the irregularities of specialists handling certain stocks on the floor of the NYSE, put it:

And who, on February 4, 1970, opened Memorex 29 points lower than its previous closing price?

(Ney gives the answer in full and devastating detail.) That particular plunge took Memorex down to about \$110, a low from which it feebly undertook to recover during the next three weeks, managing briefly to reach about \$130 per share before taking the long ride down. By the end of summer, 1970, Memorex had dipped to \$45 per share. (Its behavior since then has been one of the most spectacularly oscillatory on the Big Board.)

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\* From *The Wall Street Jungle*. Copyright © 1970 by Richard Ney. Reprinted by permission of Grove Press, Inc.

And what about the giant, IBM, with a current annual gross of about \$7 billion? In January 1970, IBM stock had a relative peak of about \$380 per share. Then, along with its lesser competitors, IBM took the ride down, and by summer hit a low of about \$240 per share. The economic picture had grayed some of IBM's luster but, across the computer industry generally, it was among those that suffered the least relative loss. After the Federal Reserve Board switched to a loose money policy in Fall 1970, IBM stock climbed fairly steadily and by Spring 1971 had almost attained its previous peak.

A corollary to the barren economy of 1969/1970 was its effect upon one of the new thrusts of the computer industry: time-sharing. The concept of a computer utility implies not merely that institutions need not maintain an in-house computer but that any individuals who can buy or lease a terminal (and of course pay for their time slice) can access a powerful computer system just as if it were their own. But a strong and reliable time-sharing system is also a valuable in-house form of computer installation for institutions with large numbers of people who may need to access a computer at the same time and whose time and talent are badly wasted with the typical two-to-ten hour turn-around times of conventional computer installations. So the construction of a computer system appropriately designed for time-sharing seems to represent one of the last rich veins of computer ore that the major computer manufacturers have yet to sink a pick into.

The prospects of commercial exploitation of the time-share market led to the formation, during 1968/1969, of a number of new companies. Of these, three sprang up from the once-fertile industrial turf of golden California: the Mascor Corporation, the Berkeley Computer Corporation, and Computer Operations, Inc. There is a tenuous but discernible relation among their origins and a curious parallelism in their demise.

Early in the nineteen sixties the Army, through its Advanced Research Projects Agency (ARPA), funded a time-sharing research and development effort by a small group of electrical engineers at the University of California, Berkeley. The result was Project Genie, which created a small but facile time-share system built around a modified version of a computer—the 930—built by Scientific Data Systems. (SDS was later to

be absorbed by the Xerox Corporation and become Xerox Data Systems.) SDS, in turn, then began production and marketing of the time-share model, calling it the 940. In late 1968 the research group at the University formed themselves into an independent company, called the Berkeley Computer Corporation, with the intent of constructing and operating a time-share system capable of supplying remote access for as many as 500 simultaneous users of the system.

The construction of a new large-scale computer is a multi-million dollar endeavor, and when the construction is performed by a company which itself is new, the initial hurdle is collecting adequate financial support. In the case of BCC, the intent was initially to construct a pair of machines and to market the time-share capability which they would embody, and thereafter to produce further machines and market them. Of course, designing a new machine implies designing the software to implement its service. BCC's estimate of its financial needs for all of this was about \$13 million. Given the meager money market, BCC was able to find only two major investors—Data Processing Financial & General Corporation\* and the University of California†—and was able to obtain only one quarter of its projected needs. By the beginning of Spring 1971, BCC had a nearly complete computer, nearly adequate software, and no money. The original investors declined to supply further support, and BCC found itself suffering the Babbage syndrome.

The short happy life of the Mascor Corporation exhibits some sharp parallels to that of BCC. Mascor was formed in the middle of 1969 largely

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\* DPF is a company primarily engaged in leasing computer systems—mostly IBM 360 systems—which, at the end of 1970 were valued at about \$180 million. The company's revenues during 1969/1970 apparently were such that it was compelled to sell or close down its eight data centers, with the single exception of BCC, in which it had invested about \$2.3 million.

† In 1969, in response to the stated intentions of the Regents of the University to impose stiff tuition fees, students pointed out that the University's \$600 million investment portfolio was yielding a notably meager return and offered some harsh evaluations of the University's ability to devise a profitable investment strategy. UC then decided to sink a substantial portion of the portfolio into "high risk" ventures—for which BCC unquestionably qualified.

by a group who had just left the IBM laboratory at Menlo Park, California, where they had been concerned with the design of advanced computer systems. The original intent of the Mascor people was, first, to quickly build a machine which would correspond to an improved version of the 940 computer (and so provide both a highly marketable machine and a system of particular interest to a particular time-share corporation which was viewed as a prospective financier); second, with the expected revenues derived from this initial production model, the Mascor people intended to build and market a large-scale computer system of advanced design.

When the dust had settled from initial attempts to obtain financing, the prospective support from the time-share corporation had failed to materialize, but Mascor had the backing of the J. H. Whitney Corporation and Electronic Memories and Magnetics Corporation. The initial support amounted to \$1.5 million, which, according to Mascor's projections, would carry the company for a year and a half. The failure in the negotiations with the time-share company led Mascor to decide to sidestep the production of the initial smaller machine and instead go directly to the design of the large-scale advanced system. Completion of this latter system would require about \$7 million, but Mascor proceeded on the assumption that when the initial design was complete, further financing would be obtainable. In particular, there was an understanding that EM&M would pick up forty percent of the further required support.

At the end of Mascor's subsidized year and a half of operations, the company arrived at just the point where it expected to be: The advanced system's architecture design was complete and part of the logic design was complete. To prospective financial backers, the company could offer a fairly exact picture of the system which it could build and market at a price of about \$5 million. But the decline in the economy had in the meantime sealed Mascor's fate. Whereas in 1969, EM&M had shown a substantial profit, for fiscal 1970 the company declared a loss of about \$14 million and an inability to provide further financing for Mascor. In the financial community generally, potential investors shrugged off Mascor as an insufficiently attractive risk: The three-to-four year turn-around in the investment looked too long and the prospects of such a

small company's being able to market such a large system were dubious.

In December, 1970, Mascor folded. Its life and death was almost synchronized with that of Computer Operations, Inc., of Costa Mesa, California. Computer Operations envisioned a powerful time-share system which it called the Gemini. The current conventional usage of computers views them as collections of capabilities. (Arithmetic/logical operation of the central processors is one capability; information transfer from memory to memory is another capability; information transfer from memory to input/output processors is another capability, and so forth.) To maximize efficiency, all capabilities should be simultaneously in use, and this is more likely to be the case if a number of independent programs are simultaneously in the computer (giving each such program a chance to use any capabilities not currently required by other programs). For a computer to handle a reasonably large number of programs concurrently requires a rather large, fast memory—or at least what *appears* to the computer as a large, fast memory, a virtual memory. In the Gemini design, the virtual memory (which results from juggling information between a fast bulk memory and a very fast but smaller adjunct memory) is divided into segments, with each segment consisting of over a billion byte addresses.

By Summer, 1970, Computer Operations had completed the logic design and sufficient system architecture to permit simulation of the Gemini's operation (on another computer) and, accordingly, the validity of the design. But superior designs are not invulnerable to the Babbage syndrome, and the classic drama of the Analytical Engine is not a hard act to follow. In the financial low tide of 1970, Computer Operations sank with hardly a ripple. As for the Gemini, it remains an impressive machine—on the drawing board.

## REFERENCES

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