3 INVESTING IN IGNORANCE

At Eberstadt, before fleeing from the dual dooms to which the research business was fated, we attempted to escape by moving upstream, incrementally shifting our role from that of investment banking agent to venture capital principal. In 1981, I had hired Jack Lasersohn into our investment banking group. Jack had been top of his class at Yale Law School and was an associate at Cravath, Swaine and Moore when he decided that he needed a more entrepreneurial career path than that available at one of the most prestigious corporate law firms in Wall Street.

Having been an undergraduate student of physics at Yale, Jack was fascinated with computers and computing and was determined to participate more directly in the industry. When we responded as a firm to persistent requests to establish a conventional limited partnership to serve our clients who wanted to be able to make a single decision in committing to our stream of private placements, Jack took the lead in managing Post-Venture Capital, LP, which was chartered to invest broadly in venture opportunities, not just in the deals we originated.

This shift in our center of gravity was not entirely voluntary. Not every one of the companies we backed as investment bankers performed like IMED and Daisy. Given our commitment to our institutional clients, when a company performed badly, we had no choice but to intervene. As I said regularly to our investors, "If we ever lose one of these companies, I will be in the emergency room with my thumb on the carotid artery, covered in blood."

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In such circumstances, our challenge was to work our way out of the role of hired gun in order to sit on the venture capitalists' side of the table. This was not an easy task, especially given that we had sold, and our clients had bought, common stock that carried neither preferential rights nor board representation. But in critical circumstances our relationship with our institutional clients provided the necessary source of leverage. Before we came to establish our own modest venture capital funds and beyond any commitments our clients made to them, they had deep pockets, far deeper than those of any venture capitalist or all of them in combination. In practice, these funds were accessible only with our active support and on terms we recommended, which endowed us with the ability to act as principal by proxy.

So I learned the venture business by coming in the back door as a sort of cross between a police officer and a garbage collector. By far the most effective mentor I had in this career-changing transition was Fred Adler, that same lead investor in Daisy Systems. While he was operating under the guise of a venture capitalist, Fred's excellence lay in his ability to take a business apart analytically and dissect the interaction of its functional operations and its financial cash flows. He was a notoriously difficult human being, treating CEOs as subordinates, and subordinates as trash. I used to tell him that the greatest compliment he ever paid me was that he never offered me a job. But it was through two collaborations with Fred that I learned the substantive consequences of taking responsibility as a financier for the economic life of an operating business.

Bethesda Research Laboratories

The first of these collaborations concerned Bethesda Research Laboratories (BRL), a pioneering producer of enzymes and other biological products needed by all who were active in the nascent field of molecular biology and the technologies of genetic engineering. Eberstadt's involvement with BRL began as a legacy of the firm's old investment banking franchise. One of BRL's co-founders was married to an heir to one of Ferdinand Eberstadt's baby blue chips, the medical device manufacturer Becton, Dickinson.

At new Eberstadt, we had become intrigued with biotechnology in the late 1970s. In 1977, Bob Swanson, the business co-founder of

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Genentech and a former sell-side investment analyst who knew Eberstadt from those days, had called me to introduce his start-up. After serious exploration of the emergent science of molecular genetics and its potential to deliver clinically effective, commercially significant therapeutic and diagnostic products, we decided not to participate as financiers. Despite the government's growing support for research in the life sciences through the National Institutes of Health (NIH), the time line from laboratory to clinic was certain to be so long, and the rate of attrition from candidate molecules to FDA-approved drug was certain to be so high, that investment returns were bound to be hugely speculative. No biotech start-up could be expected to reach positive cash flow from operations during the lifetime of the venture funds that launched it. Investment success across the prospective new industry would be far more dependent on the varying state of the public equity markets, for both primary financing and ultimate liquidity, than on the scientific and operational success of the ventures.

Here was a signal example of the game played between financial capitalism and the market economy.[1] Years later, as I contemplated the persistent determination of venture capitalists to invest in biotechnology, and the persistent willingness of the IPO market to accept and fund ventures with no predictable date for generating revenues, let alone positive cash flow from operations, I came to appreciate a significant truth. In biotech, as in information technology, all ventures are launched into a fog of uncertainty. Both IT and biotech ventures face varying degrees of technology risk: can they actually produce what they are founded to make? As Pike Sullivan characteristically put it: "when you plug it in, does it light up?" In addition, IT start-ups face at least as much market risk: if it does light up, does anyone care? But here lies the fundamental difference: market risk for biotech is radically lower.

With well-defined target patient populations and third-party funding of demand – and conditioned "only" on successfully gaining FDA approval – the prospective revenues of a biotech start-up can actually be modeled at launch, unlike any venture in any other field. Nonetheless, the odds against are long, the number of serially successful biotech VCs dauntingly few and, in retrospect, I do not regret the decision.

[1] See G. Pisano, *Science Business: Promise, Reality, and the Future of Biotechnology* (Boston, MA: Harvard Business School Press, 2006).

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We did decide at the time to remain engaged as students of the science and its long-term potential to influence and even transform the healthcare industry. We hired Scott King, a young Ph.D. biologist out of Harvard, who would be dedicated to the nascent domain, and we developed a collaboration with MIT's Industrial Liaison Program that resulted in a symposium titled "Biotechnology: Status and Prospects." The conference brought our investment clientele together with scientific leaders in the field. It took place on October 15, 1980 – by coincidence the day after Genentech's IPO brought the genetics revolution to the investing public's attention.

Beyond our work with MIT on the research side of our business, we were also attuned to the potential for a "Levi Strauss opportunity." Rather than backing any of the host of start-ups panning for gold, we wanted to find a business that delivered what all of the prospectors needed to do their work, including those still ensconced in Big Pharma and in academia. This is what BRL did, offering a growing range of the molecular tools needed to conduct genetic engineering. With the NIH as its anchor client, BRL was growing fast and had already attracted a major venture capital investor. Given our demonstrable understanding of the company's market and technology and a growing track record of success in bringing institutional equity to support the sort of company that BRL appeared to be, in 1981 Eberstadt was hired to execute a private placement that would carry the company through the estimated two years needed to reach the promised land of positive cash flow from operations. And this we did, selling some $20 million worth of common stock (more than $60 million in today's money) to our best institutional clients.

In barely three months, we learned the truth of the adage "No business is so good that it cannot be destroyed by incompetent management." The co-founder's father-in-law, although not a member of the board of directors, had prudently mandated BRL's choice of outside counsel, thereby maintaining oversight of his financial and familial investment. This was how, in January 1982, we discovered that the young entrepreneur and his scientific partner, despite the presence of that major venture firm on the board, had gone mad. The capital that was to fund BRL over the better part of the two years needed for the achievement of sustainable cash flow had disappeared in a spending spree on people and equipment and facilities unconstrained by any business discipline at all.

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I recall hearing the news on a Friday. The initial shock expressed itself in preemptive regret for the loss of what had been a promising business: not BRL, but our own post-venture corporate finance business – and with it, of course, my own career as an entrepreneurial financier. Through the ensuing sleepless weekend, however, I worked my way through the pragmatic logic of the situation. BRL was indeed a promising business with more than $10 million of annual revenue, and it was growing rapidly in a rapidly growing market. In other words, it was worth saving. To save it, however, was going to take time and money: money to buy the time needed to cut costs and stabilize operations. Our clients had ample additional resources from which to fund the turnaround, but we could not ask them for more cash unless we could do so in partnership with new leadership whom we and they could trust to use their money effectively. But, of course, we were hired agents with no seat on the board, and our clients owned common stock with no defensive protections against just such circumstances.

The order of action resolved itself into a conceptually simple sequence of events, each of which had to occur so that BRL – and our business and my career – might be saved. First, we had to secure the commitment of an experienced, credible, operational war leader who would join forces with us. Then, in partnership with this ally, we had to secure effective control of the company, subject to raising the needed new capital. In turn, we would bring our new leader and an agreed turnaround plan to our investors as the joint prerequisites for the needed new investment. Subsequent to the required radical surgery, we would recruit long-term successor management. On Monday morning, with the unanimous support of my partners, I called Fred Adler.

Fred had substantial capital in his Venad fund, but I began by explaining that we had no need for his fund's cash. In fact, it was critically important that we clear the way for our investors to be the sole funders of the turnaround operation in order to maximize their opportunity to recoup the loss of their original investment. Rather, I told Fred, we wanted to hire him to plan and execute the turnaround, and to this end I offered him 10 percent of BRL's equity if, as and when we secured effective control and refinanced the business, a commitment that, of course, at the time of the offer, it was not yet legally or practically possible for us to deliver on. I subsequently learned that Fred's acceptance of our proposal generated intense conflict with his junior partners, who understandably objected to the obvious conflict of

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interest with his own obligations to his firm and the fund he had raised. At the time, both issues proved to be blessedly irrelevant to his decision to join the project.

The next step was for Fred and me to invite the principals of the incumbent venture firm to meet us in New York for what proved to be a remarkably efficient confrontation with reality. The process was helped by the fact that the venture capitalists knew they did not command the resources required to save BRL. Their choice was clear: immediate and very public bankruptcy and loss of all of their investment, or surrender of their protections against the substantial dilution that our investors' refinancing of BRL was bound to entail. They acquiesced completely.

The following step was more melodramatic. We had to secure complete agreement to our plan from the two founders of BRL, who still owned effective control of the company. My partner John Hogan and I arrived at the company's building in Gaithersburg, Maryland, in the afternoon, knowing that if we did not get a signed agreement by that evening to the terms of an emergency bridge loan, which carried with it transfer of control, BRL would not meet its payroll on the following day. Fred was in New York, available to join us by phone at any time.

The founders' incompetence as businesspeople was easily matched by their powers of denial and evasion. Fred's extensive repertoire of threats and promises was not prevailing until, long after nightfall, a telephone message was delivered to the office where we were meeting. BRL's products – restriction enzymes and nucleic acids and other molecular tools of biotechnology – physically existed inside inoculated eggs that were held in a special-purpose rented warehouse. The owner of the warehouse now advised that if he were not paid his overdue rent by the next morning he would literally pull the plug on BRL's eggs, which meant pulling the plug on all its inventory of products for sale, which meant pulling the plug on the company itself. This, finally, was the catalyst for capitulation.

Within twenty-four hours, Fred had become chair of a newly created executive committee of the board. Within weeks, he directed a substantial restructuring of the business, while we brought in $5.5 million of new capital from our investors. My own transition from agent to principal was confirmed as I, too, joined BRL's board. By June 1982, Jim Barrett had been recruited from SmithKline to lead BRL, and the company was back on track.

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One year later, Ed Giles and I led a strategic process to merge BRL with the GIBCO life sciences division of the Dexter Corporation (which, not coincidentally, had been the first strategic advisory client of new Eberstadt's research-based corporate business). This merger created Life Technologies, a strongly profitable business with $100 million in revenue – indeed the Levi Strauss of the biotechnology industry.[2] And Fred had succeeded in constructing an outstanding group of scientific advisors including, most notably, Richard Axel of Columbia, who had already pioneered recombinant DNA technology for application in mammalian cells and who would, some twenty years later, share the Nobel Prize in Physiology or Medicine for elucidation of the genetic basis of the sense of smell. Life Technologies completed an IPO in June 1986 on a basis that provided liquidity on attractively profitable terms to Eberstadt's investors.

The BRL saga was an intense education in the financial economics of uncertainty at the micro-level. Despite our research into the emergent biotechnology industry and into BRL's own operations, we had made investments while we were fundamentally ignorant of the competence and integrity of the company's management. Unlike investors in a public company, when we began to learn what we had not known, our clients could not get out: the illiquidity discount was infinite.

Hedges against Uncertainty

Could we and our investors have hedged against our necessary ignorance? From a pre-2008 point of view – but definitely not from a post-2008 perspective – it is tempting to imagine a derivatives market in which we could have purchased that hedge. In neoclassical economic theory, the central notion of general equilibrium depends on the existence of just such a market. In that fantastical virtual space, rational agents protect themselves from the ontological uncertainties of life by trading Arrow–Debreu securities (named for Kenneth Arrow and

[2] Life Technologies had an extraordinary after-life of multiple acquisitions and rebirths until in 2014 the surviving business was acquired by Thermo Scientific Fisher for more than $11 billion. See: "Life Technologies: A Look Back," *Genetic and Biotechnology News*, April 15, 2013. Available at http://www.genengnews.com/gen-news-highlights/life-technologies-a-look-back/81248226.

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Gerard Debreu, both winners of the Nobel Memorial Prize in Economics).[3] These securities are conceived to provide exactly the state-contingent insurance for which all of us yearn. Markets for goods and services and assets are made complete by the supposition that at any point in time one can buy and sell insurance over every possible future state of the world.

In the spirit of Arrow–Debreu, let us suppose that an active market in credit default swaps – insurance against the bankruptcy of a company that evolved in the first decade of the twenty-first century – had existed in 1981. Could we have bought protection so we would have been indifferent to the failure of a business on whose quality and prospects we had bet our reputation? Even at the peak of the credit bubble in the first half of 2007, there were only a limited number of corporations against whom it was possible to purchase single-name credit insurance. Any institution prepared to write such a contract on a company at BRL's stage of development would either have had to charge a premium so huge as to make the hedge uneconomic on its face or itself have been so obviously incapable of evaluating and pricing risk as to be utterly unreliable as a counterparty.

In other words, a market mechanism for hedging the sort of ontological uncertainties that proliferate where entrepreneurial innovation meets emerging commercial opportunity has never existed, is unlikely ever to exist, and will not persist if someone is foolish enough to create it. Here is another aspect of the game between the market economy and financial capitalism: however stationary the processes of the market economy may appear to be, contracts that will guarantee the persistence of such stability through time will never be valid under all the limitless alternative states of the world that may obtain.

Does the specific instance of BRL's rescue convey some more general lesson? It does. The conjunction of available surplus cash and our success with Fred in leveraging access to that cash to wrest effective control of the company from its founders constituted a retrospective hedge against the adverse consequences of having bet on incompetent managers and inattentive directors. But the succession of contingencies on which our improvised rescue mission depended was terrifyingly tenuous. How much more efficient (as well as less emotionally arduous!)

[3] K. J. Arrow and G. Debreu, "Existence of an Equilibrium for a Competitive Economy," *Econometrica*, 22 (1954), pp. 265–290.

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it would have been to hold effective control in the first place so that, if needed, the surplus cash could have been deployed without the necessity of the face-off with the venture capitalists and the late-night cliff-hanger with the founders!

Ever since BRL, I have known that Cash and Control represent the sole conjoint hedge against the radical uncertainty that comes with the opportunity to seek outsize returns from making illiquid investments. This is a more complex proposition than venture capitalists' clichéd Golden Rule – "Whoever has the gold makes the rules" – which addresses the straightforward, bilateral game between the venture capitalist and the entrepreneur. Cash and Control relates to the open-ended, multi-dimensional game we are doomed to play with the universe at large, addressing the infinite range of possible threats to continuity from outside the frontiers of the enterprise.

My experiences in discovering how to construct defenses against the vagaries of living in this uncertain economic world are far from unique. The most successful venture-backed companies typically hold cash reserves far in excess of what conventional economic theory can rationalize as efficient. To pick five stand-out leaders of the digital economy at nonrandom, as of mid-2017 Facebook held $36 billion in cash and short-term investments; Alphabet (parent of Google) held $86 billion; Microsoft held $133 billion; Apple held $77 billion, plus no less than an additional $185 billion in marketable long-term investments. And Amazon, despite Jeff Bezos's twenty-year determination to re-invest in maximizing growth, nonetheless held $26 billion.[4] No doubt, a substantial portion of the financial reserves reflect the incentive to generate profits in low-tax regimes and hold cash receipts there, given the exemption from US taxation of profits held offshore nominally for reinvestment. But having accepted radical technological risk in the development of novel products and services, along with radical market risk to discover whether there are customers for their inventions, even the biggest winners in the Innovation Economy understandably choose to accept no financial risk whatsoever.

Although the context was different, the same strategy expressed itself in the fortress balance sheet that Jamie Dimon succeeded in building at J. P. Morgan Chase in anticipation of the Crisis of

[4] All amounts from relevant 10-Q SEC filings.

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2008. At the global level of the game, the turn toward aggressively mercantilist policies by the nation-states of East Asia, led by China, in direct response to the destruction wrought by the International Monetary Fund (IMF) in the late 1990s, has the same pragmatic motivation.[5] To avoid the threat that the IMF would again impose severe reductions in spending and increases in taxes, thereby accelerating and deepening the contraction of their economies into recession, these nations were determined to achieve the autonomy that Cash and Control ensures.

At the national level, there is a reason why policies aimed at accumulating cash and ensuring autonomy of action are termed protectionist, whether they are implemented by way of an undervalued currency or legislated tariffs and subsidies. Of course, political leaders in these instances are also serving the economic interests of those in the market economy who export and thrive on protectionist policies at the expense of the mass of consumers who suffer at the margin from the adverse shift in the terms of trade with the external world. And, of course, the intensely focused interest of the few whose wealth buys access to those in power always tends to trump the diffuse interests of the many.

The political economy of protection extends far beyond the narrow confines of the efficiency of markets. Only nations that are the most competitively productive and that hold substantial net balances of international assets can afford to implement the pieties of free trade without fear – think Great Britain in 1846 or the United States in 1945 and, as discussed at length in the Conclusion, China today. Friedrich List put it succinctly some 170 years ago: "Any power which by means of a protective policy has attained a position of manufacturing and commercial supremacy can (after she has attained it) revert with advantage to a policy of free trade."[6] All other participants on all the fields on which the game is played are on notice to develop strategies of self-insurance.

[5] E. G. Mendoza notes: "Self-insurance in response to Sudden Stops justifies large increases in foreign reserves, as observed in the past decade" – E. G. Mendoza, "Sudden Stops, Financial Crises and Leverage," *American Economic Review*, 100(5) (2010), p. 1966.

[6] F. List, *The National System of Political Economy*, trans. Sampson S. Lloyd (New York: Augustus M. Kelly, 1966 [1841]), p. 11.

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MicroPro International

The second collaboration with Fred provided an education at an even more granular level. Through working with him to save MicroPro International, I learned how to exercise operational control during crisis – how, that is, to play the role of turnaround expert. The collaboration also represented Eberstadt's most salient engagement with the PC revolution.

By the early 1980s, the killer applications for the PC had been discovered: tools for automating office work. The most visible was the electronic spreadsheet, and the first electronic spreadsheet to hit the market was VisiCalc, a product that rapidly became a brand. It was made by a company called Personal Software, which changed its name to VisiCorp, gained backing from venture capitalist Arthur Rock and from Venrock (the venture capital arm of the Rockefeller family) and hired a senior manager from Intel as CEO. VisiCorp appeared to be unstoppable. We at Eberstadt had built a relationship with Arthur Rock. According to legend, Rock had followed the New York Giants west to San Francisco and become a founder of Silicon Valley venture capital. He had orchestrated the start-up capital for Intel; had been an investor in Scientific Data Systems, the first computer company to be acquired for $1 billion (by Xerox in 1969); and, before VisiCorp, had joined with Venrock in funding Apple.

Second only to VisiCalc as an early winner was the leading word-processing software program, WordStar, spawned by MicroPro International, whose venture capital investor was none other than Fred Adler. My partner Jack Lasersohn and I set about creating the opportunity to finance these two leaders in this most dynamic market at a time when access to the public IPO market was still uncertain. VisiCorp was undoubtedly the class act, with its premier venture capital backing and professional leadership. Yet we chose to commit to MicroPro, pushed in good part by a valuation of VisiCorp that its board insisted should reflect the quality of its brand above and beyond its operating results. In addition, with BRL we had already experienced first-hand Fred's distinctive ability to cross over from independent investor to operational leader. This provided a substantial degree of insurance for making an illiquid investment in the immature and volatile world of the PC. It was an insurance policy on which we would have to make a claim.

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In early 1982, MicroPro was riding a rocket. Revenues, at $4.2 million in the fiscal year ended August 31, 1981, were on the way to $22.3 million for the new fiscal year. Seymour Rubenstein, MicroPro's founder, had possessed the vision as early as 1977 to imagine a word-processing program that would run on any of the new wave of personal computers, at a time when the term "word processor" referred to a closed, dedicated and expensive machine from IBM, Xerox or Wang. Rubenstein had teamed up with a genius programmer named Rob Barnaby to produce the first version of WordStar in 1979. When it took off in 1981, he accepted an investment from Fred.

In June 1982, Eberstadt completed another in our succession of post-venture private placements, delivering on the order of $10 million (more than $30 million in 2017 dollars) in return for unregistered, illiquid shares of common stock. And then, with extraordinary speed, MicroPro proceeded to blow up. Revenue forecasts proved as ephemeral as the growth in expenses was inexorable. In the quarter ended November 30, 1982, the company managed to lose $1.5 million on only $6.3 million of revenue.

Fred became an effective ally of us and our abused clients – a circumstance that was made more likely by the fact that one of our lead investors, General Electric's pension fund, was one of his lead limited partners. Fred's intervention was needed not least because it turned out that Rubenstein, along with a number of his followers, was a devotee of Werner Erhard and his self-empowerment movement EST. As I came to learn, ESTies (or "EST-holes" as they were called by those who knew them well) believed that "we are each responsible for our own self." This could all too readily be translated into the maxim: "If I screw you, it's your own fault."

As it turned out, Fred convinced Rubenstein that if the latter wished to avoid litigation, a price adjustment to our financing was in order. It was duly delivered by way of 250,000 additional shares issued to our investors at no additional cost. Along with negotiating this compensation, Fred took over operational control of the company, and I joined him as a sort of adjutant with Jack at my side. Fred called for a detailed structural layout of the company, with every employee tagged with her or his direct compensation and placed in the appropriate functional role and reporting relationship. We were assisted by Henry Montgomery, an experienced finance professional whom Fred had managed to convince Rubenstein to hire as CFO and who had no

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interest whatsoever in denying reality or in resisting the need for drastic action.

Being immediately on hand, Fred was able to reduce headcount by some 20 percent while maintaining operational continuity of the business and without needing any additional capital. More broadly, he showed me how to implement his dictum, "There is no such thing as a fixed cost; what matters is how much time and money it takes to turn what appears to be a fixed cost into a variable one."

The deep lesson I learned from Fred in this case was to understand the internals of a business by following the cash. He liked to deploy a time-worn anecdote to explain how he learned the fundamental importance of cash flow. Every morning his father would count the currency and coins on his bureau before putting them into his pocket. Every evening, his father would return home from work, empty his pockets and again count the cash. If he had more than he had started with, it had been a good day.

Fred's emphasis on the primacy of cash flow took on progressively greater significance in years to come. Generally accepted accounting principles (GAAP) seek to match costs with sales by accruing expenses and deferring recognition of revenue independent of the actual transfer of cash between buyers and sellers. The consequent disparities between cash flow and reported profits used to be relatively easy to track. But, by the turn of the millennium, accountants had fallen in love with the economics of efficient markets. They began to require that assets and liabilities on the balance sheet be "marked to market" at "fair value," as if the latter bore a necessary and consistent relationship to the prices generated from time to time in the inevitably less than perfectly efficient markets of the real world.

This meant that ever more experience and expertise were required to reverse-engineer the GAAP financial statements in order to expose the actual underlying cash flows. Thus, as with the elimination of fixed brokerage commissions a quarter-century earlier, an initiative motivated by an explicit commitment to increasing economic efficiency had perverse consequences. In this case, too, the financial markets were rendered less *informationally* efficient, to the significant benefit of professional investors with the time, skill and motivation to undo the accountants' work. As we shall see in Chapter 8, the process of pursuing transactional efficiency at the expense of informational efficiency has been carried a gigantic step further by the rise of index funds and exchange-traded funds (ETFs).

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Fred fixed MicroPro. After that disastrous first quarter, the full fiscal year ending August 31, 1983 showed revenues doubling to $45 million and net after-tax profits in excess of 10 percent. The next problem was to convince Rubenstein that he had to turn over managerial control to a professional CEO and yield ownership control if he were to be able to realize a return on his entrepreneurial vision through an IPO. Rubenstein had accumulated sufficient legal baggage to make his appearance in a prospectus as CEO and controlling stockholder problematic. Fred and I recruited Glenn Haney from Sperry-Univac as CEO. And Kit Kaufman of the Heller Ehrman law firm came up with a creative solution to the control issue, known as Founder's Common Stock. This had the peculiar attribute that, as long as it represented 10 percent or more of the total common shares, it could only be voted to elect one member of the board. It would convert to full voting common stock, share for share, at the time of a merger or sale of the company or when it was transferred to a party entirely independent of Seymour Rubenstein.

MicroPro went public in March 1984 at a valuation of $125 million, and Rubenstein got to sell some $8 million of stock at the offering. The stock held up for a year or so, allowing all of the investors to achieve liquidity before the entry of new competitors, first WordPerfect and then Microsoft Word, cut off WordStar's growth. Its transient market leadership had been based on code that was necessarily written in a low-level software language to generate acceptable performance from the 8-bit microprocessors that were the engines of the first generation of PCs. The new competitors had been designed from scratch to run on the next generation of 16-bit microprocessors, whose greater processing performance and memory enabled them to support a graphical user interface and to deliver WYSIWYG ("What You See Is What You Get") renderings of text on the screen. By the time MicroPro's new management realized it had to make its own core product obsolete, it was too late. This was another lesson to be learned and retained.

MicroPro had performed well enough long enough to deliver liquidity to all of its stockholders, not just Rubenstein. The contrast with VisiCorp was stark. There, management and board alike had been blindsided when Mitch Kapoor, a top developer, left to start his own company and launched Lotus 1–2–3, a product that integrated charts and graphs with numerical spreadsheets to deliver killer competition-not-in-kind. VisiCorp never managed to go public, and its investors were entirely liquidated, not liquefied.

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Only years later did I realize that in our idiosyncratic collaboration with Fred we were reinventing a wheel originally fashioned by J. P. Morgan himself. Naomi Lamoreaux and her co-authors summarize the process:

> Morgan had worked out a technique for building investors' confidence when he reorganized bankrupt railroads during the 1890s, putting his own people on the boards of directors to reassure stockholders that the business would be run in their interests. The railroads' return to profitability enhanced his reputation, and Morgan used the same method to promote the securities of the giant consolidations he orchestrated at the turn of the century. Studies . . . suggest that stockholders responded by flocking to buy the securities of "Morganized" firms and also profited handsomely from their purchases.[7]

Institutional Revolution

The context in which Eberstadt reinvented itself from agent to principal was one of industry-wide institutional revolution. The man who had offered me the chance to give up my doctoral ambitions and join the Morgan Stanley bullpen back in 1970 was Fred Whittemore. "Father Fred" was the longtime head of syndicate at the number one investment banking franchise in the Street, and thus the chief arbiter of its hierarchy of status. In 1979, Whittemore dismissed Dillon, Read and Kuhn, Loeb from the bulge bracket and replaced them with Merrill Lynch, Goldman Sachs and Salomon Brothers. National distribution and trading muscle trumped tradition. Also in 1979, Morgan Stanley itself had a painful moment when IBM required, not requested, that the firm share leadership of a $1 billion debt offering with Salomon. Morgan Stanley refused to surrender its traditional sole manager role, and the upstart Salomon got the business on its own.[8]

As corporate clients learned to use their power, the old traditions of relationship banking faded away. Merger and acquisition advice had been a free service offered by bankers to long-term clients. Beginning in

[7] N. R. Lamoreaux, K. L. Sokoloff and D. Sutthiphisal, "Reorganization of Inventive Activity in the United States during the Early Twentieth Century," National Bureau of Economic Research Working Paper 15440 (2009), p. 9.

[8] R. Chernow, *The House of Morgan: An American Banking Dynasty and the Rise of Modern Finance* (New York: Atlantic Monthly Press, 1990), p. 626.

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the mid-1970s, it rapidly became a transactional service, with every deal standing on its own and every firm charging what the traffic would bear on a deal-by-deal basis. Lewis Bernard of Morgan Stanley remarked in 1978, "Clients will do more for themselves. Our principal competition is our clients."[9] In turn, the major firms, led by Goldman Sachs and Morgan Stanley, began to invest in the people and the computer systems necessary to compete effectively against their clients – institutional and corporate – from the trading desk. This reversal of position was the fundamental change that defined the business of the investment banks, both the independents and those captive inside the universal banks such as Citibank and J. P. Morgan, in the run-up to the Crisis of 2007–2009.

During the 1980s, two developments confirmed the irreversible transformation. To obtain the capital necessary to compete as principals, the investment banking firms had to go public. In 1970, the NYSE had relaxed its generations-old prohibition to make this possible, but the opportunity had only been taken by the major retail wire houses. They had gone public to fund their investments in their branch office networks and in the first generation of the computer systems forced on them by the paperwork crisis of the late 1960s, when stock trading choked on rising volume. Now the wholesale banks followed, leveraging advanced computer systems to trade against their clients with the first generation of mathematical models for pricing financial assets.

At the same time, the Federal Reserve and the SEC began to let the commercial banks creep back into the investment banking business. Glass–Steagall had been established fifty years before to protect the retail depositors of commercial banks against the volatility of the financial markets and against the greed of bank managements intent on exploiting that volatility. The contemporaneous creation of the Federal Deposit Insurance Corporation meant that Glass–Steagall also protected the taxpayers generally by insuring them as depositors. These actions condemned the commercial banks to the slow-or-no-growth business of lending to corporate customers that were not substantial enough to access the capital markets directly.

The most aggressive of the commercial banks had historically been the most conservative: J. P. Morgan, the commercial banking side of the House of Morgan, which Glass–Steagall had divided from Morgan Stanley. By 1987, with Glass–Steagall still nominally in force,

[9] *Ibid.* 595.

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J. P. Morgan's fee revenues exceeded its income from the net interest spread on its lending business. The opportunity to play across all of the wholesale financial markets in London with the growth of the Eurodollar markets was a training experience not only for J. P. Morgan but for its commercial banking competitors as well. Appropriately, it was also in 1987 that Dennis Weatherstone, a working-class Brit without a university degree, who had grown up on the foreign exchange trading desk, became the bank's President.[10]

Wall Street was becoming open to new talent and, with more than a little lag, so was the City of London. There, hard on the heels of the Big Bang of 1986, which eliminated restrictive practices and long-standing guild-like monopolies, the "barrow boys" on the trading desks were generating more profit and taking home more money than the public school and Oxbridge-educated blue bloods of corporate finance and advisory services. As brokerage commissions declined in all markets, volume rose more than proportionately, and trading activity as a source of revenue and profit rose with volume. Moreover, the accelerating proliferation of computers, moving from routine back-office accounting functions toward the trading desk on the front line, created space for new players with new skills.

The combination of intellectual and temperamental qualities that make for successful trading – intense focus, infinite patience for haggling, a propensity for gambling – had always earned a return in the market, albeit a highly volatile one. Now those skills became ever more central to the economics of both banks and brokers. Further, the ability to analyze market data and to devise innovative trading strategies began to generate value. Those with such expertise, whether traders or trading strategists, tended not to be heirs of old Wall Street and the City of London. Relationships yielded to transactions as the source and measure of value, and the sociology of the financial markets was transformed. As more and more classes of financial assets were transformed into tradable securities – from residential and commercial mortgages, to corporate and credit card receivables, to student loans, and on and on – there were ever more transactions and ever more opportunities for the dealer banks to earn attractive spreads versus their less-informed clients.

Analytical skill, the mastery of quantitative techniques, and an all-consuming work ethic – these were required to populate the vast

[10] *Ibid.* 656.

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expansion of investment banking practices. First-class credentials that testified to such abilities now trumped family and old school ties. But something was lost as well. There was not much room for eccentricity in the new Wall Street. Perhaps that was merely an aesthetic loss. But formulaic finance and the computers that enabled it made it easy to substitute an algorithm for judgment. When I was learning how to value private companies in the early 1970s, the tools at hand were a Monroe electromechanical calculator and a book of logarithms: it took half a day to run a case, and the analyst thought long and hard about the assumptions employed. Barely ten years later, when I addressed the artificial intelligence colloquium at MIT on the valuation of ventures, the Hewlett-Packard digital calculator had already made it possible to generate innumerable cases at the push of a few buttons, so it was easy to construct whatever model was needed to rationalize the prospect of earning the required rate of return. "And then," I said at the colloquium, "came VisiCalc."

The lessons I learned from collaborating with Fred Adler to generate positive returns from start-up ventures that had seemed destined to go bankrupt cut against the grain of how modern finance theory instructs investors to manage risk – namely, by diversifying. For the venture capital investor, a fund portfolio typically consists of no more than twenty-five positions, usually in no more than two or three industrial sectors and often concentrated in only one; this is hardly an opportunity for substantial diversification. Moreover, each position is definitionally immature as a business and is subject to failure along any of several dimensions, including managerial competence, technological efficacy and market acceptance. In a venture capital portfolio, that is to say, idiosyncratic risk is both very great and quite homogeneous. And, as in the case of BRL, it cannot be hedged through any sort of transactions in markets that either do not or cannot exist. Thus, the counterpart of learning the game of venture capital in the trenches was learning that modern finance theory is largely irrelevant to its practice.[11]

My collaboration with Fred not only defined a technique for addressing the chances and contingencies that face the venture

[11] A recent, remarkably inclusive survey of venture capitalists provides evidence of the very limited use that VCs make of modern finance theory and valuation methods: P. A. Gompers, W. Gornall, S. N. Kaplan, and I. A. Strebulaev, "How do Venture Capitalists Make Decisions?" National Bureau of Economic Research Working Paper 22587 (2016), pp. 21–22.

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capitalist. Fred's mentoring also represented a case study in what Perry Mehrling calls "the money view," which focuses on the continuously evolving present moment in which "cash flows emerging from past real investments meet cash commitments entered in anticipation of an imagined future."[12] In fact, as I discuss at length in Chapter 8, what Fred taught me at the level of practice corresponds exactly with what Hy Minsky was teaching me concurrently at the level of theory. Minsky's "survival constraint" binds at the point at which currently due obligations cannot be met from operating cash flow, from new security issuance or borrowings or from asset sales. So I had the opportunity twice over to absorb the core of Minsky's extension of Keynes to encompass the "Financial Instability Hypothesis" more than twenty years before the world would have its Minsky moment in September 2008.[13]

While I was making my professional transition from investment banker to venture capitalist, it was becoming clear that the Eberstadt firm as a whole could not succeed in similarly transforming itself. To try would have entailed dismissing more than half of our partners and employees. Not even Fred could have worked out how we could reduce costs to where they could be covered by the management fees from two modest post-venture funds plus investment banking and corporate advisory fees while we maintained our distinctive competitive position. The relationships that the brokerage business had created with our institutional clients were crucial to the research-based investment banking model even as the brokerage business generated ever less direct revenues. We were facing a contradiction in our operating environment that we lacked the power, not the understanding, to resolve.

So, in September 1985, we were fortunate to learn that Robert Fleming & Company, a global investment manager and bank and a major institutional client of the firm, was seeking an American link between its London base and the hugely successful Asian joint venture it had established with Jardine Matheson in Hong Kong. As we walked back from closing the sale of Eberstadt to Robert Fleming, Pike Sullivan remarked: "Well, we got rid of the black queen."

[12] P. Mehrling, *The New Lombard Street: How the Fed Became the Dealer of Last Resort* (Princeton University Press, 2010), p. 4.

[13] H. P. Minsky, "The Financial Instability Hypothesis," The Levy Economics Institute of Bard College Working Paper 74 (1992).

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