

FINANCING THE FUTURE
(1982)

This, the earliest of the archived writings, is the text of a talk given in 1982 at a Colloquium on Artificial Intelligence, jointly sponsored by MIT's AI Lab and the Wall Street firm of F. Eberstadt & Co. Inc., of which I was then a partner. Its reflections on the manner in which innovative technologies both become candidates for speculative valuation and are themselves dependent on such speculative funding is a central theme of my book. Those reflections are all the more relevant today, when new and promising techniques of Machine Learning are generating both practical demonstrations and fevered anticipation of the renewed promise of Artificial Intelligence.

"THE DEAD PAST ISN'T DEAD, IT'S NOT EVEN PAST."

- WILLIAM FAULKNER

F. Eberstadt is an independent investment firm, wholly owned by active employees, all of whose business is based on investment research in technology-related industries. We provide brokerage services to financial institutions, information services to major corporations, and equity finance to growing companies. Our purpose is to identify, to evaluate, and to structure investment opportunities, principally for institutional investors, occasionally for corporate investors, and for ourselves as venture investors.

This MIT Colloquium presents a collective progress report on an intellectual revolution. Even more, the Colloquium itself represents a meta-report on Artificial Intelligence's progression from intellectual revolution to something more: the introduction into society's technical-industrial base of new techniques for grasping, for structuring, for discovering, for inventing reality. To use the technical term, Artificial Intelligence is in the process of becoming transparent to a rapidly expanding, increasingly diverse population of users. Conversely Artificial Intelligence's emergence from infancy is suggested by the presence and intercourse among such a varied group of practitioners from the several segments of our industrial economy: the academic, the institutional; institutionalized, large corporate; and the small corporate, entrepreneurial.

The evidence of this Colloquium is that evaluating the reality of Artificial Intelligence is of substantially greater interest in industry than among investors. In fact the evident interest of industry may represent a leading indicator. F. Eberstadt's anticipation that this is the case underlies our role in creating this Colloquium.

My task today would seem to follow from this; for Artificial Intelligence, like Biotechnology before, seems ripe for the attentions of the capital markets and those who participate in them. Now capitalism's ultimate test of enterprise—from the creation of the East Indian Company to today's hot new issue market—resides in the financing process. Whatever is to be done first is to be financed: whether through the diversion of capital resources within an existing entity or through the external funding of a new venture. Even in the public sector our political economy is so suffused by the capitalist mode of what Marx termed expanded reproduction that analogous tests of cost-benefit, payback, and return on investment are conventionally, reflexively applied—as if the arguments of the implicit analytical equations had objectively discernible and predictable values.

Three Propositions

Consider the following propositions. To discuss financing the future of Artificial Intelligence presupposes that

Proposition 1. Between those who finance and those who are financed some measure of agreement can be reached as to what Artificial Intelligence is.

Proposition 2. Artificial Intelligence has a future.

Proposition 3. The future of Artificial Intelligence will be expressed through activities that in principle are suitable cases for financing.

Before considering each of these propositions in turn, let me summarize my own response as:

Proposition 1. Unnecessary.

Proposition 2. Misconceived, and-nonetheless-

Proposition 3. In part, yes.

Proposition 1

At the margin the financing process may depend hardly at all on mutual agreement as to the actual content of the activity being funded. Perhaps the most noteworthy of all the ventures financed in the London capital market at the time of the South Sea Bubble was one "whose purpose, will be disclosed at a later time." The transaction itself may be its own reward for those who are parties to it.

Of course, these thoughts most forcefully come to mind at a time when "Greater Fool Investing" is again at a peak not seen in half a generation. Let me make two extended points. As in all exercises in diagnosis of which I am aware, a binary distinction is useful here. In a hot new issue market two generic types of buyers appear: those who buy in order to sell and those who buy in order to buy. The demand of the former depends strictly on the ability to turn the merchandise acquired for a quick gain; they have no interest in being around at that later date to learn the purpose their capital is to finance. The bubble feeds on the rationing of this demand as the characteristic, indiscriminating feeding frenzy builds its own momentum. In turn, demand from the second sort of investor is also driven by rationing yet remains by definition selective. These investors accept imperative to pay up in order to obtain the first piece of a position to be accumulated over a substantial time and at a variety of valuations. In a hot market the excessive price paid at the offering may be deemed to include an entry fee for having enough capital at risk to justify the subsequent devotion of time and energy.

In the environment of a hot market, therefore, proposition 1 is unnecessary. Yet hot markets demonstrate conclusively how one can know that, without knowing any of the specific particulars which pertain to that that. Specifically one can know that this hot market will self-destruct, the bubble will burst, the greater fools will wise up. And then communicating each venture's purpose, educating potential investors in its technical content and market promise, learning how the identification and evaluation of market opportunities shape the conception and development of technical applications—all this will again be of interest. It will, of course, concentrate interest on proposition 2.

Proposition 2

The proposition that Artificial Intelligence has a future is trivially misconceived since it evidently has so many. There may be another sense, however, in which the collective future of Artificial Intelligence is problematic. Some two years ago we at F. Eberstadt began to acquaint ourselves with Artificial Intelligence. First, we went to the various academic centers. We rapidly got a feel for the Artificial Intelligence community, its shared language and premises, its personalities and their temperaments, its broadening objects of interests. Second, we began to search beyond this Artificial Intelligentsia for more or less practical efforts to put Artificial Intelligence to work. Beyond a small number of industrial projects and a comparable number of missionary entrepreneurs, we found widespread disdain of Artificial Intelligence and even more widely spread ignorance among a variety of people who in fact were engaged in projects recognizably similar in purpose and even in approach to artificial-intelligence programs. So, in partial response to the recurrent question, What is AI? we formulated a tentative proposition: Artificial Intelligence ceases to be Artificial Intelligence when it enters the real world, at which point it becomes something like advanced Computer Science.

Over these two years we have seen a cultural transformation. The Artificial Intelligence community has swung off the defensive. The attendance at this Colloquium is the outward and visible sign of this transformation. In parallel with the process that explains why proposition 1 is unnecessary, the third level at which proposition 2 is misconceived is this: we may now be at a point of reversal, as whatever is plausibly definable as advanced Computer Science seeks to gain recognition as Artificial Intelligence. That is to say, right now Artificial Intelligence has a rather appalling future as slogan rationalizing the greed-driven triumph of hope over expectations.

It is precisely at this point that we in the audience become dependent more than ever on those at the podium. A certain discipline in the discipline is our best—perhaps our only—defense against excess. Again, as with proposition 1, there will be life after life. Beyond the generalized future of Artificial Intelligence, hyped as it inevitably will be, continuing education of users and investors in the multitude of specific features of Artificial Intelligence is in the enlightened self-interest of the community. This is just as much the case if, in reaction to today's hype, it again becomes fashionable to disguise genuine breakthroughs in Artificial Intelligence as mere incremental advances in Computer Science—all of which in turn suggests that proposition 3 does, after all, have some meaning.

Proposition 3

Beneath the frenzied froth of transiently self-justifying speculation, there is a discipline of finance. One concise formulation derived from this discipline is the capital asset valuation model. From purchase of a piece of equipment to purchase of a share of stock in a corporation, any investment can be modeled in these terms: the present value equals the sum of the discounted net cash flows more or less confidently expected to be received over a period of time.

The equation has four arguments: a discount rate, a set of cash flows, a degree of confidence, and a time period. Typically the first and last of these are set outside the realm of the model: the former influenced by market convention and by recognition of the progressively smaller contributions to present value of events at more distant dates. Consequently I want to focus on the two other arguments: the prediction of cash flows and the confidence factor.

The task of setting out a plausible pattern of revenues and expenses represents a formal discipline that all too often is satisfied in practice. All too often, the supply of numbers expands to meet the demand for rationalization. That is not to say that there is no purpose in rigorously relating forecast revenues both to a thorough evaluation of market opportunities and to the expenditures required to support them. However, I would make one further point in two different ways:

- Each step in constructing financial projections requires separate and honest assessment of the state and limits of relevant knowledge.
- Successful completion of the exercise results in a dangerously consistent reification of a piece of the future that threatens to presume an inappropriately confident degree of expectation.

Applied with intelligence and integrity, exercises in financial forecasting can function as a defense against excessive enthusiasm, whether emanating from technologists or marketing people. Such evaluations help explain how a backlog of technical innovation can cumulate, frustrating (if not bankrupting) entrepreneurial engineers and their venture investors alike. This is what is happening now with respect to the application of available technology to manufacturing processes: an order of magnitude improvement in productivity yields no positive present value when industry is operating at, say, 50% percent of capacity. Now, as with every other new technology, Artificial Intelligence will be implemented in a real, historically evolved macro- and micro-economic environment. Its implementation will be properly subject to such rational financial discipline as is available from time to time in a world of contingency and chance, driven by greed and fear.

As the world-weary investment banker said, "Never met a forecast that wasn't conservative." The closer to the frontier of knowledge that one is operating, the more important it is to concentrate on forecasting what needs to be learned. The more important, I would emphasize, to recognize those projects which are not reducible to the terms of the capital valuation model. When individual, institutional, and corporate investors are most fervently begging to be financially exploited in order to fund essays in commercial exploitation of new technology, then is the premium on responsible imprecision greatest. Except at the most absolutely cynical end of the spectrum, where the first transaction is intended from the start to be the last interaction and the next stop is Brazil, some respect is owed to the certainty that performance will be related to promise over time.

In this respect, let me offer a very different test to supplement conventional misapplication of the asset valuation model: namely, the ability to tell a plausible story as to how the venture or company in question can grow to support an excessive present value on a competitively fundamental basis - i.e., a market multiple times visible earnings - within a reasonable planning horizon. The dual implication is: that implausible stories and unreasonable planning horizons exist and that the mechanics of the capital asset model are no substitute for the exercise of experienced judgement as to plausibility and reasonableness.

Caveats

In the autumn of 1981 I spoke at the first MIT-F. Eberstadt collaboration, the conference on Biotechnology. I concluded then by suggesting that in the financing of any technology high enough to lie beyond the comprehension of the vast majority of potential investors, the guiding rule should be caveat vendor, let the seller beware, for it is the seller who will be called to account once the hype has ended and the manic market has come, as the English nanny always said it would, "to end in tears." Realism on the way in is likely to prove its own reward. Caveat vendor does not mean, given the opportunity, one ought not to take advantage of the extraordinarily attractive valuations that the market offer from time to time. It does mean that those taking advantage have good reason to convince themselves, if they can, of the plausibility and reasonableness of the story they will tell.

Many of the applications of Artificial Intelligence are likely to define ventures to be both implemented and financed within existing, large organizations, especially industrial corporations. The same is true of Biotechnology, for example. It is especially the case with respect to applications whose present value is derived from cost reduction and productivity enhancement. Selling process technology to industry subjects a new company to a double burden of risk. First, the vendor's performance is as good as the user's implementation. Second, the demand function for capacity-related goods is the second derivative of the level of final demand for the target industry's output: acceleration or deceleration for the final demand will send the derived demand from zero to infinity and back again. This means that the financing decision will often be an internal one, where the discipline on the vendors may be the more immediate as it relates to continuity of employment.

The packaging of ignorance by artifice to obtain finance distorts not only the returns actually received by investors. Distortion of research activity in order to obtain finance on such terms is both a professional and a social cost that we in this country seem illequipped to appreciate. I find it depressing not to have been surprised when I learned the extent to which the artificial-intelligence research has been funded by the Defense Department. Once again, national security offers the cover under which our society escapes from the calculus of capitalism. In Artificial Intelligence, as in all other: research activities, much that is in the laboratory should stay there and be funded as a social charge whose benefits are purely, in economic terms, external-freely decimated and unappropriated as a private return by any owner or investor. Only some pieces of the future of Artificial Intelligence should be financed as I have defined the process, and those may be the ones that by definition no longer are Artificial Intelligence.

