

In Honor of Nobel Laureate, Franco Modigliani

Robert C. Merton

When Gary Becker asked me to introduce Franco Modigliani on this occasion celebrating Franco's Nobel Prize, he noted that, by tradition, the honoree does not speak. Instead, he listens. It is the introducer who speaks, devoting 30 minutes or so to the laureate's chief contributions to economics. Now, I know of no meeting of economists attended by Franco where he didn't speak. Beyond feasibility, however, rational and optimal considerations would seem to dictate that tradition be broken, for Modigliani is surely his own best synthesizer. Such a departure seems especially apt given the central role of rationality and optimization in Modigliani's economic models. But then, of course, he has also written much about the limits of unconstrained optimization and the complexity of rationality in action. And so it is with us here. Adopting the untraditional alternative would indeed be dubiously optimal, since this occasion is designed to do Franco Modigliani honor, rather than delegate him to perform still another feat of critical summary for the enduring benefit of his fellow economists.

After this proper rationalization of my undertaking a summary, rather than imposing that task upon Franco, where shall I begin?

Franco Modigliani is a great macroeconomist. He is also a great microeconomist. Rare as this composite is, there are a few others in economics with such wide-ranging

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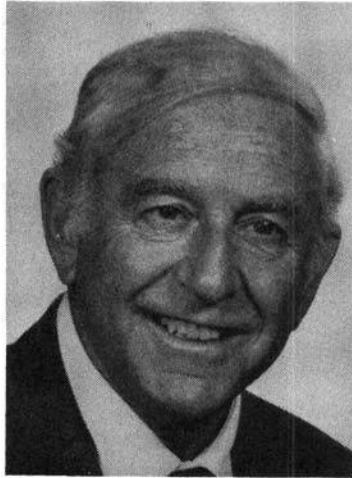
talents. But the unmistakable Modigliani stamp, the one that distinguishes him even within this small select group, is the exhaustive completeness of coverage with which he tackles substantive problems. He is not satisfied merely to develop the fundamental underlying theory, but presses on to do the empirical work necessary to test it. Having thus verified the theory, he proceeds to build the model and to make the statistical estimations required to bring his theoretical brainchild into the world of practice. This done, he supervises the running of the model, applies his wisdom in interpreting the output, and from all this draws sage recommendations for policy. It is the composite of theoretical, empirical, applied, and policy-oriented work that provides the unmistakable Franco Modigliani stamp. In the parlance of corporate finance, he is a complete, horizontally and vertically integrated, economic-research system.

Modigliani's ecumenical contributions and his diversified influence on the world of economics have led economists in just about every sector of economics to claim him as one of their own. A sampling of the ceremonial evidence of these sectoral claims includes an array of presidencies: he has served as President of the American Economic Association, of the Econometric Society, of the American Finance Association, and Honorary President of the International Economics Association. I might note that this array of presidencies forms a record held only by Franco.

The claims to Modigliani as one of their own extend beyond the sectors of our guild. To us, here in his adopted homeland of almost half a century, he is Franco Modigliani, the great American economist. Naturally, in the land of his birth, he is the great Italian economist, knighted by the Government for his profound contributions to economic theory and for his sage advice on Italian economic policy. But however much each sovereign state lays claim to him, we know that there is only one truly accurate geo-cognitive descriptor: Franco Modigliani, the great world economist.

Paul Samuelson, among other things a venerable observer of the practices of science and scientists, has produced incontrovertible time series evidence that the Modigliani presence at an institution has practically guaranteed a quantum jump in its standing as an innovating center for economic research (Samuelson, 1987). I need do no more than mention the University of Illinois, Carnegie, Northwestern and MIT economics as prime examples of Paul's theorem. I would only add that Modigliani's appointment twenty-five years ago to MIT's Sloan School of Management has unquestionably proven to be the most important one in that school's history.

The Samuelsonian observation comes, of course, as no surprise to those who have had the great good fortune to be a student or colleague of Modigliani. Merton Miller, Albert Ando, and Richard Brumberg; Emile Grunberg, Jacques Drèze, Stanley Fischer, Richard Sutch, and Robert Shiller; and certainly not least, Herbert Simon and Paul Samuelson, along with two-score other scholars—all these share this one significant thing in common: they have all collaborated with Modigliani on important scientific work. Just as Franco is the first to say that each of his co-researchers brought out the best in him, just as surely would each of them declare that working with Franco led them to exceed even their own high-mean performance. This intellectual collective, with Modigliani as its common factor, has produced some 150 scientific



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papers and several books. The quality, quantity and breadth of that collection give it preeminence in exemplifying the synergistic benefits of collaborative research in economics.

Summary involves abstraction from complex concreteness. And in the case of Franco Modigliani, we must be severely selective in our abstractions. The wide scope and unflagging volume of his researches allow me to touch upon only a few dimensions of that work. Here, as on many other occasions, I have engaged Franco's help. Having him list his favorite papers neatly provided an opportunity for tradeoff between the best summary (which requires that *he* undertake the task) and doing Franco Modigliani all due honor (which requires that *he not*).¹ As it obviously did to those selectors in Stockholm, his papers on saving behavior and corporate finance would surely be the first to come to mind in any list of Modigliani's chief accomplishments. Franco's own list is no exception.

Between 1952 and 1954, Modigliani and Richard Brumberg wrote two essays setting forth a theory of the determinants of individual and national saving which came to be known as the Life-Cycle Hypothesis.² As we know, macro theories of

¹Having Modigliani himself choose the articles has the additional feature of providing some interesting data to the historian of science. In asking Franco to make his selection, I left the criteria for choice purposely vague. By the demanding criterion that was evidently applied, he selected only twenty-eight from a universe of more than two hundred articles and nine books. These twenty-eight are listed in Appendix A.

²See Modigliani and Brumberg (1954) on individual consumption-saving behavior and Modigliani and Brumberg (1980) on aggregate consumption-saving behavior. Although widely circulated in its 1954 manuscript form, the research on aggregate consumption did not appear in print until a quarter century later. The long delay in publication was the direct result of the deep personal loss Modigliani felt with the untimely death of Brumberg shortly after the manuscript was completed.

saving behavior at that time were largely dominated by the early Keynesian model. Based on more traditional utility-maximizing behavior, the micro theories of saving at that time were purely static models, with saving treated as just one of the many goods the consumer could purchase from current income. Both the micro and macro theories held that current income is the chief determinant of individual and aggregate saving behavior, and held specifically, that saving increases with a rise in current income.

As in the roughly contemporaneous development of the related Permanent Income Hypothesis by Milton Friedman (1957), the Modigliani-Brumberg methodology departed significantly from analyses of the time. More closely aligned with the earlier work of Irving Fisher, the Modigliani-Brumberg model was dynamic; it posited rational, utility-maximizing consumers who optimally allocate their resources over a lifetime of consumption.

It was not only their methodology that differed from then-current theory; their conclusions differed also. Although hard to imagine from today's perspective, the propositions derived from the Life-Cycle Model were taken at the time as rather counterintuitive and in some cases, almost as paradoxical.

The core of these propositions is that for the Life-Cycle consumer, current consumption depends not on current income, but on current wealth (including capitalized lifetime wage income). Thus, short-run changes in saving are largely influenced by the difference between current income and lifetime, sustainable income based on current wealth. Therefore, changes in current income need not be a reliable indicator of the changes in saving.

Although the Life-Cycle Model shares this result with Friedman's Permanent Income Hypothesis, its explicit accounting for a significant retirement period, a finite lifetime, and bequest motives for each consumer provided richer and more detailed prescriptions about saving behavior, especially long-run saving. At the aggregate level, the Life-Cycle Model makes clear that the aggregate or social savings rate of a nation cannot be used to infer the characteristics of the thrift behavior of individuals. Thus, a low national savings rate need not imply a spendthrift citizenry. It might instead reflect demographic and productivity differences across time and space.

Modigliani and Brumberg established that bequests of wealth from one generation to the next are not essential for an economy to accumulate a very substantial stock of wealth relative to income, and established further that this can be so even with a zero social saving rate. Indeed, the Life-Cycle Hypothesis is antipodal to the Marxian theory of saving, which has rich capitalists as the only savers. In its most basic form with no bequests, homothetic utility and perfect capital markets, the Life-Cycle Model holds that all—poor as well as rich—save for retirement.

Paul Samuelson (1987) has observed, "The Life-Cycle Theory is a great theory, but it is not great merely to the degree that it irrefutably describes empirical data. It is a paradigm that asks the right questions about the data. Even if there should ultimately emerge a consensus concerning a quantitatively important bequest component in savings, that will not vitiate the fertility of Modigliani's contribution." Once again, as almost always before, I agree with Paul Samuelson. Novelty, elegant simplicity and impeccable logic—not empirical accuracy—were the prime sources of

locomotion for moving the Life-Cycle Hypothesis into the main line of economic thought and for keeping it there. Yet it is just as much a plain fact that at the time of its publication, the Life-Cycle Hypothesis provided a consistent, rational explanation for most of the well-established empirical findings on saving, findings that were otherwise seen as anomalous for the simple Keynesian theory. Moreover, both as explanation of the data and as guide to policy, the Life-Cycle Model has weathered remarkably well these past 30 years. An outcome, we all know, which Franco Modigliani has done more than only help to ensure.

The other sphere of accomplishment explicitly cited by the Nobel Selection Committee is the pioneering collaborative research of Modigliani and Merton Miller on the theory of corporate finance. In a series of papers in the late 1950s and early 1960s, they established several propositions about the financing of corporate investment that became collectively known as the "MM Hypothesis." (See Modigliani and Miller, 1958, 1963; Miller and Modigliani, 1961.) You will note that the acronym "MM" is not only much shorter than the plausible alternative "Mi-Mo," but it also neatly handles the rather cumbersome switch to "Mo-Mi" required to reflect those occasions when Miller and Modigliani deviated from the standard alphabetic ordering.

The MM Hypothesis can be summarized in two propositions. First, in an environment with well-functioning capital markets and no differential tax treatments, if a firm's capital investment policy is held fixed, then the current market value of that firm is independent of its choice of financing structure. That is, the firm's value is not affected by whether it chooses to finance its investments through equity, debt or any other financial instrument.

Second, in this same environment and again holding investment policy fixed, the current market value of the firm is unaffected by changes in planned dividend payments for any future period. Thus, given the firm's investment decision, its dividend-payout policy is irrelevant to determination of the market price of the firm. In short, the MM propositions state that given investment policy, none of the firm's financing policies matter.

When MM was published, nothing could have been further removed from the minds of the finance profession (academic or practitioner). It was held as a self-evident truth that every firm has a unique optimal financing structure of debt and equity. The selection of dividend policy was treated as one of the most important decisions for the firm and thus, one quite properly assigned to the very top echelon of management. There was even a body of empirical work (of sorts) that claimed to show that a \$1 increase in dividends had four times the impact on share price of a \$1 increase in retained earnings. In that environment of strong beliefs, the logically clear arbitrage analysis used by MM to derive their propositions provided a disturbing and compelling argument that most of the existing prescriptions about corporate finance were seriously flawed.

Although one could hardly suppose it from the hundreds of subsequent empirical studies of the MM Hypothesis, Franco is fond of noting that the original MM pieces were written "tongue-in-cheek" with respect to the theory's empirical validity. But there was nothing tongue-in-cheek when it came to alerting the profession to the point

that the existing theoretical foundations of corporate finance rested not on bedrock but on quicksand.

The MM analysis established the now commonplace practice of taking each corporate financial instrument as a piece that cannot be properly analyzed without reference to the whole of the firm's liability structure. Without this basic methodological insight, it is doubtful that the modern, unified theory of corporate liability pricing based on options analysis would have been developed.³

Perhaps most fundamentally, the Modigliani-Miller work stands as the watershed between "old finance," an essentially loose connection of beliefs based on accounting practices, rules of thumb and anecdotes, and modern financial economics, with its rigorous mathematical theories and carefully documented empirical studies.

The reactions of the profession to both the Life-Cycle and MM Hypotheses illustrate a pattern common to many a Modigliani paper. First, the conclusions are seen as "counterintuitive," or to use a favorite Franco phrase, "completely crazy." Then upon further reflection, undoubtedly aided by the clarity of the supporting analysis, these same conclusions are seen as altogether "obvious."

At the time of the Prize, the popular press applied a new twist to this same theme, as they evidently decided that Modigliani was perhaps the first economics laureate whose work they could really understand. And so the Life-Cycle Hypothesis was simplified into "people with more money spend more." And the MM Hypothesis became: "No matter how you slice a pie, the sum of the sizes of all its pieces is the same." Now, that truly is obvious!

As rightly recognized by the judges in Stockholm, the Life-Cycle Hypothesis and the MM propositions are the greatest jewels in the Modigliani crown. But we of the guild should also take note that whole tiers of Modigliani contributions qualify in their own right as research of the very first class.⁴ I had intended to move rapidly through these tiers, guided by that precious list Franco generously provided for me. But I see now that time does not permit even such a brief excursion.⁵ Rather, I close with a few

³The interested reader might wish to examine Black and Scholes (1973) and Mason and Merton (1985) for discussion of the theory of option and general contingent claims pricing and its relation to the MM theory. Varian and Rubinstein also discuss these topics in the symposium on arbitrage in this issue.

⁴Objective evidence of the impact on the field of Modigliani's other work is the list of his ten most-cited papers reported by Garfield (1986, p. 5) and presented here in Appendix B. Of the ten, seven of these papers are in areas outside the Life-Cycle Hypothesis and corporate finance. Number of citations is, of course, dependent on the date of the article's publication and the time period of the survey. Although large, the number of citations reported for the Life-Cycle and MM papers are nevertheless understated. It is common practice for articles to discuss the Life-Cycle and MM hypothesis without formally citing the underlying papers. Such "obliteration-by-incorporation-as-canonical-knowledge" (Merton, 1967, pp. 27-28; 35-37) surely reflects the extraordinary impact of this work in economics.

⁵The need for such an excursion is happily reduced by P. Kouri's (1986) excellent review of Modigliani's contributions to economics. In addition to the Life-Cycle Hypothesis and the MM theorems, Kouri covers Modigliani's contributions to macroeconomics (including his classic 1944 article refining the Keynesian model and his central role in the development of the MIT-Penn-Social Science Research Council model of the U.S. economy); the planning of production, inventories and the work force; the role of anticipations and plans in economic analysis and forecasting; the term structure of interest rates; credit rationing; and international finance. I would only add that his 1954 paper with Emile Grunberg on the predictability of social events when the prediction can influence the outcome, deserves an important place in the foundation of modern rational-expectations theories in economics.

observations on the Modigliani style of thought and action gained from the vantage point of being both his student and his colleague.

Franco has, of course, an instantly recognizable presence at MIT, particularly but not wholly at the Sloan School. Each happy generation of graduate students transmits the Franco lore to the next, perplexed generation. A quick sampling will suffice:

- Expect fast-paced and well-founded speech; when enthusiasm overtakes him, he ignores the bureaucratically imposed limit of a 90-minute lecture.
- Write your thesis under Franco's direction, and expect to *double* the amount of time required to complete it.
- Thesis writers, be prepared to convince your spouse that the midnight phone calls and weekend sessions truly are with Franco.
- Recognize that Franco's econometric technique provides lessons in valuing substance more than form.
- Share his infectious fun and pleasure in taking economics seriously.
- Be the beneficiary of his deeply critical yet affectionate concern with every one of his students.

As with student lore, so with collegial lore: all this, plus one fundamental caution. With Franco in your seminar, *never*, but *never*, yield the chalk!

All this lore was put to use in planning the gathering of colleagues, near and far, on Martha's Vineyard in September '85, to pay tribute to Franco a full month before he and the rest of us learned the happy news from Stockholm. The format for this oral Modigliani Festschrift was clear: twelve minutes for each of the twelve papers devoted to Franco's diversified contributions; five minutes for each formal discussant, and of course, after each paper, unlimited time for Franco. Punctuated by Franco's high enthusiasm, these sessions went on for two glorious days.⁶

On that occasion, as on every other occasion honoring Franco, he gently reminded us of his one enduring collaborator in all things, his beloved Serena. So here we raise our glasses high in a salute to Serena and Franco!

■ *This address was given at the Luncheon Honoring the 1985 Nobel Laureate in Economics, Franco Modigliani, at the annual meetings of the American Economic Association held in New Orleans, Louisiana on December 29, 1986.*

Appendix A

Self-Selected Favorite Papers of Franco Modigliani

Monetary Theory and Policy

"Liquidity Preference and the Theory of Interest and Money," *Econometrica*, January 1944, 12, 45–88.

⁶The papers are collected in Dornbusch, Fischer and Bossons (1987).

"New Developments on the Oligopoly Front," *Journal of Political Economy*, June 1958, 66, 215–232.

"The Monetary Mechanism and Its Interaction With Real Phenomena," *Review of Economics and Statistics*, February 1963, 45, 79–107.

"Innovation in Interest Rate Policy" (with R. Sutch), *American Economic Review*, May 1966, 56, 178–197.

"Central Bank Policy, the Money Supply, and the Short-Term Rate of Interest" (with R. Rasche and J. P. Cooper), *Journal of Money, Credit, and Banking*, May 1970, 2(2), 166–218.

"Inflation, Rational Expectations and the Term Structure of Interest Rates" (with R. Shiller), *Economica*, February 1973, 40, 12–43.

"On the Role of Expectations of Price and Technological Change in an Investment Function" (with A. Ando, R. Rasche, and S. Turnovsky), *International Economic Review*, June 1974, 15, 384–414.

"The Monetarist Controversy, or Should We Forsake Stabilization Policies?" *American Economic Review*, March 1977, 67, 1–19.

"The Management of an Open Economy with '100% Plus' Wage Indexation" (with T. Padoa-Schioppa), *Essays in International Finance*, No. 130, International Finance Section, Department of Economics, Princeton University, December 1978, 1–43.

"The Structure of Financial Markets and the Monetary Mechanism" (with L. Papademos), *Controlling Monetary Aggregates III*. Conference Series No. 23, Federal Reserve Bank of Boston, 1980.

Life Cycle Hypothesis

"Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data" (with R. Brumberg). In Kurihara, K. K., ed., *Post Keynesian Economics*. New Brunswick: Rutgers University Press, 1954, pp. 388–436.

"Long-Run Implications of Alternative Fiscal Policies and the Burden of the National Debt," *Economic Journal*, December 1961, 71, 730–755.

"The 'Life-Cycle' Hypothesis of Saving: Aggregate Implications and Tests" (with A. Ando), *American Economic Review*, March 1963, 53, Part 1, 55–84.

"The Life-Cycle Hypothesis of Saving, the Demand for Wealth and the Supply of Capital," *Social Research*, Summer 1966, 33, 160–217.

"The Life-Cycle Hypothesis of Saving and Intercountry Differences in the Saving Ratio." In Eltis, W. A., M. F. Scott, and J. N. Wolfe, eds., *Induction, Growth and Trade: Essays in Honor of Sir Roy Harrod*. Oxford: Clarendon Press, 1970, pp. 197–225.

"Monetary Policy and Consumption: Linkage via Interest Rate and Wealth Effects in the FMP Model," *Consumer Spending and Monetary Policy: The Linkages*. Conference Series No. 5, Federal Reserve Bank of Boston, June 1971, 9–84.

"Utility Analysis and Aggregate Consumption Functions: An Attempt at Integration" (with R. Brumberg). In Abel, A., ed., *The Collected Papers of Franco Modigliani: The Life Cycle Hypothesis*. Vol. 2. Cambridge: MIT Press, 1980, pp. 128–197.

"Government Deficits, Inflation, and Future Generations." In Conklin, D. W., and T. J. Courchene, eds., *Deficits: How Big and How Bad?* Ontario Economic Council: Ontario Economic Council Special Research Report, 1983, pp. 55–77.

"Life-Cycle, Individual Thrift, and the Wealth of Nations," in *Les Prix Nobel*. Stockholm: The Nobel Foundation, 1986, 260–281. Reprinted in: *American Economic Review*, June, 1986, 76, 297–313.

"Government Debt, Government Spending and Private Sector Behavior: A Comment" (with A. Sterling), *American Economic Review*, December 1986, 76, 1168–1179.

Finance

"The Cost of Capital, Corporation Finance and the Theory of Investment" (with M. H. Miller), *American Economic Review*, June 1958, 48, 261–297.

"Dividend Policy, Growth and the Valuation of Shares" (with M. H. Miller), *Journal of Business*, October 1961, 34, 411–433.

"Corporate Income Taxes and the Cost of Capital: A Correction" (with M. H. Miller), *American Economic Review*, June 1963, 53, 433–443.

"A Suggestion for Solving the International Liquidity Problem" (with P. Kenen), *Banca Nazionale Del Lavoro Quarterly Review*, March 1966, 76, 3–17.

"The Reform of the International Payments System" (with H. Askari), *Essays in International Finance*, No. 89, International Finance Section, Department of Economics, Princeton University, September 1971, 3–28.

"International Capital Movements, Fixed Parities, and Monetary and Fiscal Policies." In Bhagwati, J., and R. Eckaus, eds., *Development and Planning: Essays in Honor of Paul Rosenstein-Rodan*. London: George Allen & Unwin, Ltd., 1972, pp. 239–253.

"Inflation and the Housing Market: Problems and Potential Solutions" (with D. Lessard). In Lessard, D., and F. Modigliani, eds., *New Mortgage Designs for Stable Housing in an Inflationary Environment*. Conference Series No. 14, Federal Reserve Bank of Boston, 1975, pp. 13–45.

"The Inflation Proof Mortgage (IPM): The Mortgage for the Young." Unpublished Paper, 1983.

Appendix B

Ten Most-Cited Papers of Franco Modigliani^a

"Corporate Income Taxes and the Cost of Capital: A Correction" (with M. H. Miller), *American Economic Review*, June 1963, 53, 433–443.

^aBased on Science Citation Index, 1955–1985, and Social Science Citation Index, 1966–1985. Papers listed in descending order in terms of number of citations. Source: Garfield, 1986, p. 5, Table 1.

"Utility and the Consumption Function: An Interpretation of Cross-Section Data" (with R. Brumberg). In Kurihara, K. K., ed., *Post-Keynesian Economics*. New Brunswick: Rutgers University Press, 1954, pp. 338–436.

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"Debt Management and the Term Structure of Interest Rates: An Empirical Analysis of Recent Experience" (with R. Sutch), *Journal of Political Economy*, August 1967, 75, Part II, 569–589.

"Liquidity Preference and the Theory of Interest and Money," *Econometrica*, January 1944, 12, 45–88.

"Inflation, Rational Valuation and the Market" (with R. A. Cohn), *Financial Analysts Journal*, March/April 1979, 35, 24–44.

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