MEMORIALIZING MILTON FRIEDMAN:
A REVIEW OF HIS MAJOR WORKS, 1912–2006

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Introduction

Milton Friedman was born in July 31, 1912, in Brooklyn, NY, to Jewish immigrants, Jeno Saul Friedman and Sarah Ethel Landau, who immigrated to Brooklyn, in 1890, and 1895, respectively. Friedman's parents came from Barehovo, Ukraine, which was formerly part of Hungary and Czechoslovakia. When Milton Friedman was 13 months old his parents moved to Rahway, New Jersey. His education included violin lessons, but he decided he did not have a talent for music. Friedman attended Washington Public School, where he skipped the sixth grade and transferred to Columbus School in the seventh grade, both public schools in Rahway. Ironically, he was nicknamed "Shallow" at that time. Although he attended Hebrew school in the afternoon after public school and was "bar-mitzvahed," Friedman became an agnostic at an early age of twelve.

From 1924–1928, Friedman attended Rahway High School, where his favorite subjects were political science and geometry. Besides that, he participated in sports, won an oratory competition, and almost read out the local public library. He won a scholarship to attend Rutgers University in New Brunswick, NJ, then a private school.

He had "a small purse," so he held two part-time jobs—at a men's department store at $4 a day wage, waiting tables at a restaurant for the wage of a free lunch, and as a copy editor of the student newspaper, while at Rutgers. Friedman said that the opportunity cost of the restaurant job was the only "C" grade he received.

Friedman intended to major in mathematics at Rutgers. He took the actuarial exams, but since he failed some of them, he switched to economics. The economics department at Rutgers had two stalwart economists, Arthur F. Burns, who was writing his Ph.D. at Columbia, and Homer Jones who had been a student of Frank Knight, and completed graduate work at the University of Chicago. Friedman profusely praised them for their teaching, influence and friendship. Friedman mentioned a seminar that Burns gave, which he attended with only one other student. The project was to go over Burns's dissertation: "That seminar imparted standards of scholarship—attention to detail, concern with scrupulous accuracy, checking of sources, and above all, openness to criticism—that have affected the whole of my subsequent scientific work" (Friedman and Friedman 1998, 30). Friedman studied insurance and statistics with Homer Jones. It was Jones who introduced Friedman to the "Chicago view" of individual freedom and the right reform policy. Friedman wrote that "Had Homer not chosen to spend a couple of years teaching at Rutgers, I would almost certainly not have gone to Chicago." He also remarked that besides being at the bottom of the Great Depression, ". . . becoming an economist seemed more relevant to the burning issues of the day than becoming an applied mathematician or an actuary" (Ibid., 1998, 33–34).

Friedman entered the University of Chicago in 1932. At Chicago he met Rose Director in Jacob Viner's class on "Price and Distribution Theory." Viner's policy was to seat students alphabetically, which put Friedman and Rose Director next to each other. Eight years later, on June 25, 1938, they were married under full religious tradition in New York. At Chicago, Friedman studied History of Economic Thought with Frank Knight, Monetary Theory with Lloyd Mints, and Correlation and Curve Fitting with Henry Schultz. Friedman said: "I took courses enough to have the equivalent of a master's degree in mathematics—which stood me in very good stead in my later career" (Ibid., 1998, 39).

Friedman received his M.A. from the University of Chicago in 1933, and with the encouragement of Schultz, obtained a Fellowship to study with Harold Hotelling at Columbia during 1933–1934, in his second year of graduate work.

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At Columbia, he studied mathematical statistics with Hotelling, Business Cycles and History of Thought with Westley C. Mitchell, and Pure Theory and Institutions with John Maurice Clark. Friedman recommended that "the ideal combination for a budding economist was a year of study of Chicago, which emphasized theory, followed by a year of study at Columbia which emphasized institutional influences and empirical work—but only in that order, not the reverse" (Ibid., 1998, 480). Friedman returned to Chicago in 1935, as a research assistant to Schultz. He wrote: "I ended up satisfying the requirements for a Ph.D. other than the dissertation at both Chicago ... and Columbia" (Ibid., 1998, 51). His Ph.D. from Columbia in 1946 dealt with professional income distribution.

Having graduated, Milton Friedman went to work in Washington. He wrote: " . . . ironically, the New Deal was a lifesaver for us personally. The new government programs created a boom market for economists, especially in Washington. Absent the New Deal, it is far from clear that we could have gotten jobs as economists" (Ibid., 1998, 58). Friedman took a job with the National Resources Committee (NRC) for $2,600, annually, much more than his $1,600 assistant job with Schultz at Chicago. The NRC job was in the statistical area, involving sample design, surveys, and the preparation of final report on the cost of living index. After two years at the NRC, Friedman wrote "I had become an expert on consumption studies, and had acquired experience with practical statistics that supplemented my knowledge of mathematical statistics, something that stood me in good stead throughout my scientific career" (Ibid., 1998, 66). At NRC Friedman developed a statistics test on "the analysis of ranks" to compete with "the analysis of variance," which is known as "Friedman's test" (Friedman 1937, 1940).

In 1937, Friedman quit the NRC and moved to the NBER in New York, where he worked with the future Nobel Laureate, Simon Kuznets, on wealth and income distribution. His major task at the NBER was to work on income differentials among professionals. Friedman divided income into permanent, quasi-permanent, and transitory income, in order to study dynamic changes in income distribution over time, which led to his important contribution in economics, namely, the permanent income hypothesis.

Friedman's awards are too numerous to list. In 1951 Friedman won the John Bates Clark Medal honoring economists under age forty for outstanding achievement. In 1976 he won the Nobel Prize in economics for "his achievements in the field of consumption analysis, monetary history and theory, and for his demonstration of the complexity of stabilization policy." He was president of the American Economic Association in 1967 and economic adviser to Presidents Richard Nixon and Ronald Reagan. In 1977, Friedman retired from the University of Chicago and became senior research fellow at the Hoover Institution at Stanford University, where he continued his research program in monetary economics and political and economic freedom.

Friedman's Place in the History of Economic Thought

Friedman earned a prominent place in the history of economic thought. Between 1960–1975, his research ideas had a commanding influence in Macroeconomics. "Milton Friedman, who had returned to Chicago in 1946, was the primary architect of these policy views. Before that time he had written little on economic policy . . . Friedman proceeded to establish three lines of work, which together constituted his fundamental contributions to the formation of the Chicago School. First, he revived the study of monetary economics . . . He used the quantity theory of money, and refurbished and extended it . . . Second, he presented strong defenses of laissez-faire policies . . . finally, he developed and employed modern price theory" (Stigler 1988, 150–151). We use Stigler's insight as a springboard for our assessment.

Monetary Theory

The quantity theory of money is the basis of Friedman's contribution to monetary economics. Basically, the theory relates money and its velocity of circulation to prices and transactions. Friedman restated the classical quantity theory in terms of a demand for money function. His restatement explained five types of assets for holding wealth: "(i) money (M), interpreted as claims or commodity units that are generally accepted in payments

of debts at a fixed nominal value; (ii) bonds *(B)*, interpreted as claims to time streams of payments that are fixed in nominal units, (iii) equity *(E)*, interpreted as claims to state pro-rata shares of the returns of enterprises; (iv) physical non-human goods *(G)*; and (v) human capital *(H)*" (Friedman 1956, 3).

Analyzing the returns from the five assets yields a number of variables that affect the velocity of the circulation of money in the model Friedman (Ibid., 1956, 11) advanced with two pivotal equations:

$$\frac{M}{Y} = \frac{1}{v\left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{Y}{P}, u\right)} \quad (1)$$

$$Y = v\left(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{Y}{P}, u\right)M \quad (2)$$

where, *Y*, is income or returns to all forms of wealth, *v* is income velocity, *P* is price level, *w* is ratio of human to non-human capital, r_b is rate of interest on bonds, r_e is rate of interest on equity, *u* is taste and preference, and *M* is demand for money.

The question arises about the predictive ability of these equations. Equation 2 can be turned into a theory of output determination if the variables that affect velocity can be explained. Equation 1 can spotlight a theory of price by solving for price in terms of the other variables, particularly income determination. Friedman's restatement is now carried in textbooks in a simplified form as follows:

$$\frac{M^d}{p} = f(y_p, R - R_m, \pi^e - R_m) \quad (2a)$$

The income variable y_p is permanent income, which we explain more fully in the consumption function section. The other two terms explain that demand for money depends on the opportunity cost of holding money. The term $R - R_m$ measures deviation of financial return *R*, from the return on money, R_m, and the last term measures deviations of the returns of holding money from the expected inflation rate. A major difference between this specification form and the Keynesian demand function is that Keynes prefers to separate the transaction and speculative demand, while Friedman is concerned more with total asset demand. This broader approach introduces more interest rates into the demand function, rather than just a single interest rate for a British console bond that never matures. Milton Friedman's specification for the demand for money is amenable to empirical test-ing. He has evolved a technique for the estimation of the term structure of interest rates within the demand function. Friedman remarked, "the whole term structure, including yields for very long holding periods, affects the quantity of money demanded. There is no a priori reason to regard a 'short' rate or a 'long' rate as 'the' alternative cost of holding cash balances" (Friedman 1977, 21). Following a suggestion by Heller and Khan (1979), Friedman and Schwartz (1982) used the following two-step technique to incorporate the term structure into the demand for money function. First, they fitted a quadratic equation for the yield curve for each year from 1873 to 1975, in the form:

$$R_i(\tau) = a_{0i} + a_{1i}\tau + a_{2i}\tau^2 \quad (3)$$

where R_i is the yield per bond of year *i*, and τ represents years to maturity. In the second step, these parameters are used in place of the interest rate variables in the demand for money function, resulting in the estimated form (Friedman and Schwartz 1982, 204):

$$\log m = -1.93 + 1.21 \log y - 2.78a_0 - 298a_1$$
$$-13,823a_2 - 0.71g_y + 0.185S + 0.021W \quad (4)$$

where the variables are in their log arithmetic form, g_y is percentage change in nominal income, substituting for nominal yield on physical assets, *S* is a dummy variable for lower velocity in 1929–1954, *W* is a dummy variable from post war adjustment, *y* is real income per capita, and *m* is real balance per capita. The estimates were significant, and the r-square was 0.9916. Equation 4 has the power of economizing in having to fit equations that have to accommodate the entire term structure such as of the form:

$$M^d_t = f(y_p, R_{it} \ldots R_{nt}) \quad (5)$$

where there are now many interest rates on financial assets, ranging from the shortest maturity, $t = 1$, to the longest $t = n$. Equation 4 reduces the variables by restricting the parameters.

Both the Keynesian and the Friedman paradigms are still active for empirical research. Friedman's major argument against discretionary monetary policy is that it tends to be destabilizing because of lags. Modern extensions of macroeconomics within the CGE (Computable General Equilibrium) domain of research maintain this position (Blanchard and Fischer 1990, 581).

The predictions of the quantity theory were backed by theoretical arguments. In 1969, Friedman advanced a model of his monetary theory is search of the optimum quantity of money. He likened it to a Japanese garden, characterized by simplicity and unity of a complex reality. He simplified monetary theory by making 13 assumptions. The fixed assumptions included: 1. Population. 2. Taste. 3. Physical resources. 4. Technique, 5. A stationary state. He assumed 6. Competition, 7. Durable capital goods. The do not assumptions included: 8. No exchange of capital goods. 9. No lending or borrowing. 10. Only exchanges of money for services and vice versa allowed. The operational assumptions included: 11. Prices are flexible. 12. Money is a fiat, and 13. Money is a fixed number of pieces of paper, $10,000 (Friedman 1969, 2–3).

In this economy, people can hold money as a medium of circulation, or as a reserve. Assumption 5 posits a stationary but not a static economy, where the latter would imply that people would conduct all transactions at one time, obviating the need for a circulatory function of money and even eliminating uncertainty. The amount of money citizens will want to hold depends on its velocity, which is assumed as 10 percent. Therefore, given fiat money, citizens will want to hold $1,000 (10,000*0.1).

To see the model evolve, we introduce some money into the economy via a helicopter, which makes a one-time drop of a $1,000. Individuals will gather money equal in proportion to what they held before, which in this case will double their cash balance. But individuals are in stable equilibrium. Had they wished to double their cash balance, they would have done so by some adjustment in the past. Individuals would now want to spend their excess cash balance, thanks to the helicopter incident. When others receive their spending, they too will be in the same situation of wanting to hold less cash balance. In this way the amount of money injected into the economy by the helicopter will translate into a proportional increase in prices, given the other fixed assumptions.

The bottom-line argument from Friedman's monetary theory is that monetary policies have strong influences on the economy. This potent influence has given birth to the aphorism that 'money matters,' whether in its weak form "money too matters" or in its strong form "only money matters." Because of the strong influence of money on

economic activities, Friedman wanted to guard against the mismanagement of monetary policies. One thing to safeguard against is the lags with which changes in the money supply influence the economy. Because of these lags, Friedman thought the good intentions of the monetary policy makers to stabilize the economy might result in destabilization. He, therefore, became a staunch advocate for monetary policy rules, arguing against discretionary policies. Briefly, the debate of rules versus discretion started at the University of Chicago with the economist Henry Simons (1936). For Simons, the essential point for a test is to find stable and definite legislative rules of the game for economic freedom (Simons 1936, 3). Given a tendency to hoard or dishoard money, or if many substitutes for currency and deposits exist, "near moneys," then the fixed scheme is easily defeated. Friedman (1969, 48) advocated the "5 percent and the 2 percent rules." In the 5 percent rule, "the aggregate quantity of money is automatically determined by the requirements of domestic stability" (Friedman 1948, 252). The 5 percent rule addresses short run phenomena such as rigidities and lags. The 2 percent rule is aimed at more long run phenomena that require nominal interest rates to equal the opportunity cost of producing money for the interest rate to be approximately zero.

In Friedman and Schwartz's study *A Monetary History of the United States,* they subject the money matters hypothesis to several historical tests. Three tests stand out relating to price behavior for 1879–1914, to the World War I and World War II periods, and to the Fed's tight required reserves policies in 1937–1938. To explain the inflation after 1896, we notice that prices declined between 1879–1896 by approximately –0.93 percent annually, and increased between 1897–1914 by approximately 2.08 percent annually. Money to output increased between 1879–1896 by 2.29 percent annually, and between 1897–1914 by 4.23 percent annually, being driven up by the new gold supply. Base money, defined as currency plus reserves, increased between 1879–1896 by 3.49 percent annually, and between 1897–1914 by 4.8 percent, annually. One cannot rule out the possibility, therefore, of some association between money and prices after 1896. In the second case, between 1914–1920 money to output increased 8.45 percent annually, while the price level rose 10.84 percent annually. But, the differences were reversed

between 1939–1948, when money to output increased 7.90 percent annually and price level increased 6.65 percent annually. Yet, we can say that the correlation between money and prices appears similar. In the third case, during the 1937–1938 recession, the Fed doubled required reserves, resulting in a decrease in the money stock by –0.37, a decrease in prices by –0.50, and a decrease in output by –8.23 percent during that one year; thus shedding light on the causation between money and economic activities.

An issue pointed out recently by Paul Krugman (2007) concerns the period 1929–1933. The money base increased from $6.05 billion in 1929 to $7.02 billion in 1933, while the money supply fell from $26.6 billion to $19.9 billion, reflecting bank failures. People seemed to have a high liquidity preference. At issue is whether the Fed that increased the money base should be blamed for the fall in the money supply. Friedman's point was that the Fed could have prevented bank failures.

Friedman's policy rules have taken on a different manifestation in the modern economy. In the hands of Kydland and Prescott (1977) policy rules are used to improve social optimum. People's expectations change, for instance, with changes in new administrations in Washington. One frequent change in expectations of this sort is in regards to taxing policies. Such changes, however, lead to other changes that may not lead to an optimum situation. With Barro and Gordon (1983), policy rules have a home in efforts to eliminate surprise inflation. In adjusting their expectation of inflation to eliminate surprise inflation, people's actions can lead to higher money supply and inflation. Policy rules can stop such expectations-driven inflation from occurring. Such adjustments can occur within a gaming situation where policy makers can break rules and cheat in order to get more employment by lowering inflation. In such games, policy makers put their reputation and credibility on the line.

Objections to Friedman's Monetary Positions

From the MIT perspective, the "Chicago view" was somewhat shallow. According to Paul Samuelson, "Dennis Robertson's Cambridge handbook on *Money,* and Alfred Marshall's unitary-elasticity demand for money were the alpha and omega of that allegedly subtle oral tradition. At the London School of Economics (LSE) and Harvard, the same macro economics prevailed" (Samuelson 1986, 263). The framework did not measure up: "when at long last Milton Friedman came to write down in the 1970 *Journal of Political Economy* what his monetarism was analytically, it turned out to be one specification of the general Keynesian identities and behavior functions and not a very plausible one at that" (Samuelson 1986, 262).

In a recent interview, Paul Samuelson, who studied the "Chicago view," put it under historical scrutiny. He underscored that Irving Fisher (1867–1947) was influenced by his financial losses during the Great Depression to lose faith in the belief that velocity was quasi constant. Similarly, he underscored that Arthur Cecil Pigou (1877–1959) had retracted his criticisms of the Keynesian system. Samuelson then made a blanket attack on Friedman's monetary view as follows: "what those gods were modifying was much that Milton Friedman was renominating. . . . It is paradoxical that a keen intellect jumped on that old bandwagon just when technical changes in money and money substitutes . . . were realistically replacing the scalar M by a vector . . . the pity of it increases for one who adopts a simple theory of positivism. . . . Particularly venerable is a scholar who tries to test competing theories by submitting them to simplistic linear regressions with no sophisticated calculations of Granger causality, cointegration, collinearities and ill-conditioning, or a dozen other safeguard econometric mythologies" (Samuelson 2007, 146).

Samuelson's objection does not negate the influence Friedman has had on monetary matters. Every student of economics has heard of his monetary policy rule, his natural rate hypothesis, that inflation is a monetary phenomenon, which is of paramount importance to modern policy makers. Friedman's monetarist appeal may be due to his appealing logic. This is how he explained that inflation is a monetary phenomenon: "Suppose the nominal quantity that people hold happens to correspond at current prices to a real quantity larger than that which they wish to hold. Individuals will then seek to dispose of what they regard as their excess money balances; they will try to pay out a larger sum of the purchase of securities, goods, and services, for the repayment of debts, as gifts than they are receiving from the corresponding sources. However, one man's expenditures are another's receipts. One

man can reduce his nominal money balances only by persuading someone else to increase his. The community as a whole cannot in general spend more that it receives. . . . If prices and income are free to change, the attempt to spend more will raise the nominal volume of expenditures and receipts, which will lead to a bidding up of prices and perhaps also to increase in output. If prices are fixed . . . the attempt to spend more either will be matched by an increase in goods and services or will produce 'shortages' and 'queues'" (Friedman 1968, 434).

According to Franco Modigliani, Friedman's position was that wages were not rigid and unemployment involuntary as Keynesian had supposed. The proper focus should be on deviation of the actual from the unexpected price changes. At the apparent level, an anticipated fall in demand is taken to be the cause of lower prices, output, and employment. What happens in fact is that workers fail to grasp the essence of the current fall in prices and nominal wages. For instance, workers misperceive a fall in money wages as a fall in real wages. They would then curtail the supply of labor, pushing up the real wages, reducing employment and output. All this would happen because a misperception has caused a cut in supply, and not because of the unanticipated fall in demand (Modigliani 1986, 6). But such a misperception cannot last but temporarily. The misperception will come to an end when expectations are realized. Friedman's novel insight is to reverse the Phillips curve argument that excess employment causes inflation. He made the argument that expected inflation causes excess employment, underscoring the aphorism that stabilization policies are themselves destabilizing. Such a dictum arises because full employment is an uncertain phenomenon. The parameters of the Phillips curve drift over time, therefore, targeting an unknown inflation rate might turn out to be incorrect, creating volatile movements. These considerations call for special policies, such as the constant growth in the money supply that would put the economy in an automatic mode, searching to find the unknown natural rate (Modigliani 1986, 14).

Following Milton Friedman (1968) and Edmund S. Phelps (1967), Modigliani recognized that the Phillips curve relationships were unstable because "they resulted from actions of economic agents induced by unanticipated price fluctuations under conditions of imperfect information. Expectation errors could persist, resulting in transitory output fluctuation, but in the long run actual and expected price changes could not deviate systematically. Consequently, in the steady state there is a unique 'natural full-employment output level which is invariant to permanent inflation" (Papademos and Modigliani 1990, 415).

Other Novelties of Friedman's Research

Hyper Inflation

Friedman held that "The quantity theorist accepts the empirical hypothesis that the demand for money is highly stable . . . the sharp rise in the velocity of circulation of money during hyperinflations is entirely consistent with a stable functional relation, as Cagan so clearly demonstrated" (op. cit., 16). Cagan's model for hyperinflation was pivotal for future development, as it incorporated the rate of change of expected prices. It is expressed as:

$$\log_e \frac{M}{P} = \alpha E \gamma \qquad (3)$$

where the demand for money function is reduced to only the expected rate of change in prices, E, and two constants, α and λ. But E was loaded with forward-looking developments. It depended on the actual rate of change of prices that was "approximated by the difference between the logarithms of successive values of the index of prices" (Cagan 1956, 35). It incorporated an adaptive mechanism and imitated permanent effects that Friedman was concerned with in his Consumption Function hypothesis.

Cagan's results (1956, 91) were that "Hyperinflation at least can be explained almost entirely in terms of the demand for money. This explanation places crucial importance on the supply of money . . . involves the motives of government, with whom the authority to open and close the spigot of note issues ultimately lies."

Philosophy and Methodology

Friedman maintained a libertarian view of philosophy on the one hand, and a positive view of science on the other.

Laissez Faire

Three major premises cover Milton Friedman in this area: Adam Smith's market system, The Declaration of Independence, and Mill's idea that "Over himself, over his own body and mind, the individual is sovereign" (Friedman and Friedman 1979, 1–2). The philosophical underpinnings of these premises are found in their earlier book *Capitalism and Freedom*. In that work, we find that a "major theme is the role of competitive capitalism . . . as a system of economic freedom and a necessary condition for political freedom" (Friedman and Friedman 1962, 4). It is fair to say that "through his books, his long-running column in *Newsweek,* his public television series *Free to Choose,* and countless speeches and television appearances, [Friedman] has consistently and eloquently made the case for individual freedom . . . he has expounded a wide-range of libertarian agenda, notable including abolition of the draft and decriminalization of the use of illegal drugs" (Boaz 1997a, 292).

In his exposition of the Laissez faire concept, Friedman weaved his argument around social philosophic terms such as economic, political, and individual freedom. We have collected a sample of the usage of these terms, and then analyze how Friedman used them to promote his point of view.

On Economic Freedom (EF)

"The free man will ask neither what his country can do for him nor what he can do for his country. He will ask rather 'What can I and my compatriots do through government to help us discharge our individual responsibilities, to achieve our several goals and purposes, and above all, to protect our freedom?'" (Friedman and Friedman 1962, 2).

". . . economic freedom is an end in itself . . . economic freedom is also an indispensable means towards the achievement of political freedom" (Ibid., 8).

"History suggests only that capitalism is a necessary condition for political freedom. Clearly it is not a sufficient condition. Fascist Italy, Fascist Spain, Germany at various times . . . Japan before World Wars I and II, tsarist Russia in the decades before World War I . . . are all societies that cannot conceivably be described as politically free. Yet, in each, private enterprise was the dominant form of economic organization" (Ibid., 1962, 10).

"In the early nineteenth century Bentham and the Philosophical Radicals were inclined to regard political freedom as a means to economic freedom. They believed that the masses were being hampered by the restrictions that were being imposed upon them, and that if political reforms gave the bulk of the people the vote, they would do what was good for them, which was to vote for laissez faire . . . the triumph . . . was followed by a reaction toward increasing intervention by government . . . intellectual descendants of the Philosophical Radicals—Dicey, Mises, Hayek, and Simons. . . . Their emphasis was on economic freedom as a means towards political freedom" (Ibid., 10).

On Political Freedom (PF)

"Political freedom means the absence of coercion of a man by his fellow men" (Friedman and Friedman 1962, 15).

For Hayek, the state of liberty or freedom is "that condition of men in which coercion of some by others is reduced as much as is possible in society. . . . The state in which a man is not subject to coercion by the arbitrary will of another or others is often also distinguished as "individual" or "personal" freedom" (Hayek 1960, 11).

Relationship between IF, EF

Friedman is high on the scale of both individual freedom (IF) and economic freedom (EF), and his position is not to settle for an intermediate point of the two. In *Free to Choose,* he shuns market socialism for instance, which will fall some way in the joint distribution of a function say, $F = f (IE, EF)$. Perhaps, Boaz had it right when he stated that Friedman is high on a 2-dimension scale of them, a libertarian view where one does not go out on a limb for just individual freedom as the liberals do, or out on a limb on economic freedom as the conservatives do (Boaz 1997b, 32).

Another shade of Friedman's view is that EF under competitive capitalism implies political freedom (PF). In prepositional logic terminology this

can be stated as the existence of a competitive market economy (CME) such that EF implies PF:

$$\exists CME, EF \supset PF \qquad (1)$$

First, we may study in what sense Friedman intends this implication to hold. Friedman holds that political freedom can be achieved quickly. In his visit to Czechoslovakia and Poland (*Free to Choose*, Tape #3), Friedman noted how, as a result of one demonstration, a government can be overturned; but one year later, economic freedom still had not been achieved. If at all we can write that economic freedom follows political freedom, we must acknowledge that it will have to be with a long lag:

$$\exists CME, PF(t - i) \supset EF \qquad (2)$$

In eq. 2, the lag $(t - i)$, in the case of those Former Soviet Union (FSU) economies, it has not materialized as yet. If it turns out that economic freedom materializes in thoses FSUs, then we will be enlightened about how competitive markets work in that area. What is required for a successful transformation of those FSUs, according to Friedman, is for governments to move rapidly to put into place the institutions that would lead to economic freedom, for economic freedom is not based on race or culture, but on economic institutions based on free private markets.

Second, is it possible in the long run that political freedom with competitive market institutions will lead to economic freedom? Unless we can answer this question in the affirmative, we cannot use strict implicative arguments of eq.1, because one of the three ways in which eq.1 can be true is: *EF* is false and *PF* is true. How then can Friedman hold that economic freedom is necessary for political freedom? One sense of this statement to be true is in the *modal logic,* and not in the *prepositional logic,* where the terms "possible" and "necessary" are related.

The "necessary," and the "possible" are foundational terms in Modal Logic, which is a branch of logic that goes back to Aristotle. For our purpose, "it is sounder to view modal logic as the indispensable core of logic, to view truth-functional logic as one of its fragments, and to view 'other' logics—epistemic, deontic, temporal, and the like—as accretions either upon modal logic . . . or upon its truth-functional components" (Bradley and Swartz 1979, 219). Some of the modal possibilities in Friedman's argument can be listed as follows:

1. The economy can change into the same social state it was in before.
2. It can take another social form.
3. It can remain in an undeveloped state, where economic freedom through competitive markets can remain only a dream.
4. A former socialist country cannot be trans formed into another form of society.

An example that Friedman discussed that had these possibilities is that of Yugoslavia, where Marshal Tito was able to break away from Stalin's Soviet Union. Yugoslavia remained a communist country but practiced decentralization. "The collapse of communism and its replacement by a market system, seems far less likely, though as incurable optimists, we do not rule it out completely. Similarly, once the aged Marshal Tito dies, Yugoslavia will experience political instability that may produce a reaction toward greater authoritarianism or, far less likely, a collapse of existing collectivist arrangements" (Friedman and Friedman 1979, 56–57). It must be kept in mind that these transition stages do not bear the implication of eq. 1, but are only possibilities. For instance, Friedman explicitly condemned the approach of "democratic socialism," a system offered as a bridge between "totalitarian socialism" such as the former FSU, and capitalism as a system of economic freedom (Friedman and Friedman 1962, 7–8).

Then the implied question is the true value of this expression. Friedman stated that economic freedom is both an end and a means. As an end, it is "a component of freedom broadly understood" and it is an "indispensable means towards the achievement of political freedom" (Boaz 1997a, 293).

Dixon faults Friedman for holding that "both political freedom and economic freedom may be construed in the same way" (Dixon Ibid., 25). They are rather desirable ends.

Positive Economic View

Friedman expanded and articulated a positive economic viewpoint. In doing so, he was reacting to the science of Human Action expounded by L. Von Mises. In *Human Action,* Mises wrote that: "Action is will put into operation and transformed into an agency, is aiming at ends and goals, is

ego's meaningful response to stimuli and to the conditions of its environment; it is a person's conscious adjustment to the state of the universe that determines his life" (Mises 1963, 11). One of his faithful students wrote: "The Fundamental praxeological axiom is that individual human beings *act.*" To Rothbard (1970, 65) "Praxeology asserts the action axiom as true, and from this (together with a few empirical axioms—such as the existence of a variety of resources and individuals) are deduced, by the rules of logical inference, all the propositions of economics, each one of which is verbal and meaningful." So, for Rothbard (1951, 943), "This axiom of action is indisputable and important truth, and must form the basis for social theory." Although this is a broad definition, it has been narrowed in several ways in current popular applications to economics. A text for instance holds that the core of action is scarcity, from which economizing behavior and trade-offs follow, and it juxtaposes reactions, consequences, choices, and individualism to the "Economic Way of Thinking" (Heyne et al., 2003, 5).

Friedman was reacting to the soul of Austrian methodology called the "axiom of action." According to F. A. Hayek, the axiom's core feature is ". . . logically the statements of theories [that] are independent of any particular experience" (Hayek 1992, 148). This would make it a purely a priori science. As Rothbard puts it: "We do not know, and may never know with certainty, the ultimate equation that will explain all electromagnetic and gravitational phenomena; but we do know that people act to achieve goals. And this knowledge is enough to elaborate the body of economic theory . . . the fact that people act to achieve goals implies that there is a scarcity of means to attain them. . . . Scarcity implies cost, which in a monetary system . . . [is] reflected in prices, and so forth" (Rothbard 1973, 315). To label the action axiom a priori then puts it in opposition to the empirical models. But Hayek assured us that the difference between Mises' position and that of the falsificationist, Karl Popper, is "comparatively small," while a larger difference exists between them from the naïve empirical point of view (Hayek 1992, 148).

Friedman then set out to create a general empirical economic method, specializing it to the positive view. Its central message is that we judge a theory by its ability to predict and explain phenomena. Friedman started by enunciating John Neville Keynes' positive, normative, and instrumental viewpoints as the economic method. Positive economics is a system that can make correct predictions in economic matters. It requires a theory or hypothesis that has valid and meaningful predictions about economic phenomena not yet observed. The theory represents complex reality by way of an abstraction. A theory can be distinguished as a language where it will not have substantive content because it would be a tautology. However, a theory can also be described as a hypothesis where it will have substantive content for testing and validation.

Problems arise with Friedman's methodology when we note that theories have not only implications but also assumptions. Friedman defends the view that the realism of the assumptions is not a test of the hypothesis. For instance, if someone were to argue that imperfect competition has less realistic assumptions than perfect competition, Friedman would not consider that as a valid test to reject imperfect competition. The criteria for testing these models are their predictions and explanations of reality, and not the realism of their assumptions. To see the difference more logically, reasoning from realism of assumption to true theory is like a priori testing. In a priori reasoning, the statement that P implies Q, $P \supset Q$, is true when both P and Q are true, both are false, and when P is false, Q is true. But Friedman's positive empirical view requires that the true value of Q has to be empirically true in order to make P true.

Friedman's positive economic doctrine has one element of uncertainty that has opened up opportunity for other variants of positivism. About 20 years ago, the first author of this paper wrote to Friedman on this matter that the number of times a theory must fail before we give it up is still an open question in his methodology. The question was why he criticized the HUD Section 8 program based on one empirical point that he mentioned about how the program allowed a tenant to live in an expensive apartment, paying more for rent than some of the private market rate tenants. This instance that he cited I argued represented only one circumstance which may be connected with a few others. The question then proceeds as to how many times must a program fail by his methodology before we abandon it. Friedman, with his every so charming wit replied, "Enough is enough." We must realize

that this is a serious criterion for the falsification of the positive doctrine. The methodology of science carries this innocent chat as two aspects of falsificationism, namely, naive and sophisticated. In the naive case, only one instance of a phenomenon is enough to falsify a theory, while in the sophisticated case, one will have to accumulate enough anomalies and stay with a degenerating program long enough before rejecting it.

In this instance also, Friedman took the opportunity to point out that the question was in the vein of defending the "Status Quo." He was referring to his book, the *Tyranny of The Status Quo,* in which he denounced government activities beyond what will be allowed under a free market mechanism. To defend those programs would mean to defend the status quo. To the extent that Friedman advocated programs such as the negative income tax, therefore, he did so from the point of view of stopping the movement away from free market goals, and not for the inherent characteristics of those programs.

Risk Analysis

Milton Friedman presented a lucid explanation of the expected utility hypothesis (EUH) that telescoped further development (Friedman 1976, 77–78). Given a stream of income, I_i, and their associated probabilities, P_i, the expected utility is the sum of their product. Utility enters when we form a function of income, $F(I)$, whose products with their respective probabilities generate a special function, $G = \Sigma_{i-1}^{\infty} P_i F(I_i)$. In the special instance where income is expected with certainty, $P_i = 1$, both the G and F functions have the same value or utility. Further development of this hypothesis turned on the uniqueness of specifying the utility function. Current literature suggests a concave function that can be written as: $U(butter, bread) = U(\chi_1, \chi_2) = -\exp[-\chi_1^5 + e^{-\chi_2}]$ (Samuelson 1986, 162). Risk enters if we consider the shapes of the utility function. The expected value of the prospect is a straight line probability weight of the prospects. The expected utility is the probability weighted average of the two utility functions. If we plot utility, $F(I)$, against, income, I, then the average income yields three values of average utility, one for the expected utility, one for the utility function based on a concave shape, and one for the utility function based on a convex shape. A concave (from below) average utility function would measure aversion to risk and would be preferred to the expected average of the income. A convex (from below) average utility function would measure risk lovers, and yield the reverse preference. If we eliminate scale and origin from the utility function by the restrictions $I = 0$, $F(I) = 0$, and $I = 1$, $F(I) = 1$ $F(I)$ $I = 0$, then we can determine utility values for any values of income. However, without such restrictions, the utility function can take on recurrent concave (from below) shapes, making it unwise for someone to pay an infinite sum to play the St. Petersburg game.

We can use the EUH to clear up confusion about subjective and objective probability in experiments on expectation analysis. Given a choice between two prospects, we ask people to state their preference, before a set of events A *and B in X, occurs.* The offer might be to receive $1 *if event A = [(H)* ead, (Head)] occurs, or event $B = [H, T; T, H;$ T, T] occurs when two coins are tossed. *If the* agent takes event B, then we regard the choice *as* putting higher probability to B. Utility values are absent since the agent gets $1 whether he chooses A or B. The probability of the outcome exceeds half, since both A and B are mutually exclusive and exhaustive events. Through repeated experiments, we need to find out the agent's indifference position, i.e., when he would put a 50:50 chance to A and B, or a probability of 0.25 to each of the four outcomes in the toss of the two coins. When we know the indifference position, we can tell when the agent's preference is greater or less than 50 percent. This way, the agents behave "as if" they associate personal probabilities with outcomes. If individuals as a group agree on their personal probabilities, the analysis is considered objective, resulting in risk analysis.

Although psychology is not involved in the personal probability analysis, agents do embrace some typical attitude and understanding in making their choices. "The dollar I win is not as worthwhile to me as the dollar I lose" (Samuelson 1986, 134). "A poor man generally obtains more utility than a rich man from an equal [money] gain" (Bernoulli 1938, 24) (Samuelson 1986, 147). "Positive love of Gambling" (Friedman and Savage), Samuelson 150). "At fair odds. it is 'better to have a relatively

large gain with small probability than to have a small gain with large probability'" (Samuelson op. cit., 154). Some other ways of expressing attitudes include: "leisure of gambling," the "love of danger," the "joy of expert gamesmanship" (Ibid., 136). The work of Savage illustrates a "look before you leap" attitude that reduces all decisions for the future to the present time. Assume we have made a choice, f, over many actions, f, g, h. If the state of nature, which measures uncertainty, is either good or bad, then we will have logical outcomes that can be written as $f(Good) = Outcome_1$, and $f(Bad) = Outcome_2$ (Savage 1972, 15). By imposing a simple order for choosing which action among f, g, and h that are available, we can have empirical models that either predict behavior, or normative models that make our decisions consistent. Further assumptions under the names of the "sure thing principle" or the "independence axiom" attempt to place order on the outcomes. In Savage's model, if one is neither delighted in risk, nor averse to risk, then he/she would maximize the mathematical expectation, which is the probability of the state times the outcome.

If one is risk averse, then he/she would maximize an EUF function, such as one developed by von Neumann (Chambernowne 1969, 98). The attitude that "The dollar I win is not as worthwhile to me as the dollar I lose" (Samuelson 1986, 134) leads one to avoid even finite fair bets in their expectation. The utility function captures this attitude in its nonlinear form. While the mathematical expectation suggests that the game should be played infinitely, the nonlinear utility function suggests that agents would stop at a finite moment of play.

If the probability of the uncertain state of the world is unknown, than we look for a range of probabilities, a probability distribution. This means that the probability, P, lies within a certain range [0.1, 0.2]. We can use the average of the two endpoints, a minimax strategy, of a combination of the average and a minimax strategy to measure uncertainty. Following the discussion of Savage, if we have two states of uncertainty with payoffs 80 and 21 for state I, and payoffs 20 and 30 for state II, for agents A1, and A2 respectively, then the expected payoff for A1 is 29, and for A2 is 28.65, using the average probability of 0.15. The agent will choose 29 to maximize its expected payoff. Using a minimax strategy, we would use a probability of 0.1 on A1 expected value, and 0.2 on agent A2 expected

value to get 26 and 28.2 payoffs respectively. But we have to use a mixture of probabilities as well. Calculating the mixture of returns for states I and II, and solving for the probability that would maximize the minimum value would yield a probability of 0.13, which in turn puts the payoff at 28.6 (Chambernowne 1969, 99–103).

Several steps have been made to 1) Link expectations of belief with classical probability theory, 2) Linking choices over uncertain prospects with classical probability, 3) Linking choices over uncertain acts that are consistent with probabilistically sophisticated belief over event likelihood (Machina and Schmeidler 745–746).

We expect the economic agents to be rational in their expectations, in the sense of consistency of choice, conformity with self-interest and maximizing behavior, and following reason in general. The future can be in a good or bad state, making the expected outcome risky or uncertain. If conditions in the future look so bad as to render economic events unpredictable, then we may regard expectations as given, i.e., exogenous (Hicks 1984, 7). Subjectively, economic agents may feel confident about an outcome, but such confidence varies among individuals. Objectively, individuals with the same information should reach the same expectation. We examine how economists incorporate expectation measures into their equilibrium or optima models, a method called substantive rationality, or into their delibrating procedures, a method called procedural rationality (Simons 1936, 130–132).

Consumption Function

Milton Friedman advanced the Permanent Income Hypothesis of the consumption function in order to reconcile inconsistencies in the observations of short and long run marginal propensities to consume. The term permanent income is used because consumers spend from their lifetime resources. Friedman suggested an estimate of Permanent Income by a distributed lag method, where the lags reach backward into negative infinity. The degree of the lag occurred to a 17th degree polynomial. The term "transitory income" is the difference between current and lifetime income. If you get paid for overtime, or a once in a while Christmas bonus, you may consider that income temporary. The tax cut in 1964 by President John F. Kennedy was permanent.

The one year tax surcharge passed by President Johnson in 1968, and the ERTRRA tax cut in 2001 by President George W. Bush are clearer examples of transitory phenomena. Because transitory income is consumed over many years, its effect on consumption may not be felt.

One way to distinguish temporary from permanent in reality is to plot the percentage change of per capita income and consumption over time. One notices that while the change in income has many sharp spikes, the change in consumption would not react to those spikes, and would be rather uniform over time. Therefore, we can assert that transitory income has a negligible effect on consumption.

Friedman (1957, 26) specified the consumption function as:

$$c_p = k(i, w, u)y_p$$
$$y = y_p + y_t$$
$$c = c_p + c_t$$

where p is permanent income, t is transitory income, i is interest rate, w is wealth, and u is taste and preference. One implication of these PIH equations is that consumption based on permanent income will be constant if the bracket items are constant over time. The consumer intends to consume from permanent income at a uniform rate. Saving depends on transitory income in the short run, but is independent of the permanent income. The literature suggests that we should estimate permanent income as a measure of past income plus a change in income from the past to the current period. This solves two problems: the last period income persists in the future, and the consumer will not likely treat the increase in income as being permanent. Having defined permanent income, we can now make consumption a function of it. Past income, change in income, and wealth drives determine consumption over time.

In PIH, growth leads to a decrease in saving because it sets up the expectation that future income will exceed current income, allowing people to spend more currently.

Friedman's Nonparametric Test

Because Friedman's test is not generally used by economists, we introduce it in this section using an example. In statistics, a parameter represents a population value such as the mean, variance, and standard deviation. A statistic is a calculation from a sample of a population. A nonparametric test considers less stringent conditions than a parametric test would. In particular, a nonparametric test does not involve knowledge of the distribution from which the sample is drawn.

Friedman's test is an alternative to a two-way analysis of the variance F-test. We do not use the F-test because we think that the assumptions for using it are not met by the data. The data is ordinal, which means that it is ranked. Table 1 presents the rank data of family income by types of expenditure in a two-way classification (Friedman 1937, 677).

The inputs in Table I are ranked based on the standard deviations of the dollar values of cells, where the ranks by row is from 1 to 7, which is the number of columns. Each of these columns represents an income level that will stimulate a type of expenditure for the, n, row elements. The test consists of the

Null hypothesis: H_0: That the p distributions of the family income are identical.

Alternative hypothesis: H_a: A least two of the seven stimuli differ in the distribution of their family income.

Friedman's test statistics is:

$$\chi_r^2 = \frac{12}{np(p + 1)}\sum R^2 - 3n(p + 1)$$

$$\chi_r^2 = \frac{12}{(14)(7)(7 + 1)}(24{,}572)$$
$$- 3(141)(7 + 1) - 40.1076$$

Where the sum of squares of the rank is,

$$\sum R^2 = 23^2 + 36^2 + 53^2 + 57^2 + 70^2 + 70^2$$
$$+ 57^2 + 83^2 = 24{,}572$$

We reject the null hypothesis if the Friedman test statistic exceeds the values of the Chi Square Distribution at a critical level. We calculated the Friedman test statistic as 40.1076. "The probability of a value greater than 40 is .000001. There can thus be little question that the observed mean ranks differ significantly, i.e., that the standard deviation is related to the income level" (Friedman 1932, 679). The Friedman test is used in the literature, and is included in standard statistical packages such as SPSS, SYSTAT, and MINITAB.

TABLE 1.
Income and Rank of Standard Deviation for Friedman's Test Annual Family Income
(Treatment or Stimulus)

Category of Expenditure							
Expenditures	$750–$1,000	$1,000–$$1,250	$1,250–$1,500	$1,500–$1,750	$1,750–$2,000	$2,000–2,250	$2,250–$2,500
Housing	5	1	3	2	4	6	7
Household Operations	1	3	4	6	2	5	7
Food	1	2	7	3	5	4	6
Clothing	1	3	2	4	5	6	7
Furnishings	2	1	6	3	7	5	4
Transportation	1	2	3	6	5	4	7
Recreations	1	2	3	4	7	5	6
Personal Care	1	2	3	6	4	7	5
Medical Care	1	2	4	5	7	3	6
Education	1	2	4	5	3	6	7
Community Welfare	1	5	2	3	7	6	4
Vocation	1	5	2	4	3	6	7
Gifts	1	2	3	4	5	6	7
Others	5	4	7	2	6	1	3
Total:	23	36	53	57	70	70	83

Conclusion

Since a portion of the previous issue was dedicated to Paul A Samuelson, it is appropriate to tell of the warm collegial relations that prevailed between Samuelson and Friedman. Samuelson frequently spoke of Friedman's influential presence. Samuelson notes that Friedman and he were "able to identify the source and texture of our disagreements in a way that non-economists cannot perceive. . . . I could disagree 180° with his policy conclusion and yet concur in diagnosis of the empirical observations and inferred probabilities." Samuelson and Friedman often disagreed strongly, but with great civility. In a 1976 Newsweek article, following his winning of the 1976 Nobel Prize in Economics, Samuelson discussed Friedman: "The fact that he and I, despite our policy disagreements and scientific differences, have remained good friends over 40 years says something perhaps about us, but even more I dare to think about political economy as a science."

Milton Friedman had kind words for Samuelson as well: "though Paul and I have often differed sharply on issues of public policy, we have been good personal friends and have respected each other's competence and contributions to economics. Paul described the situation very well in a comment in a letter of December 8, 1995: 'I hope it will be said of us that, though we disagreed on much, we understood wherein our logical and empirical differences were based and that we were pretty good at preserving amiability, friendship, and respect throughout.'"

Friedman wrote, "Paul and I were subject to very much the same intellectual influences at the University of Chicago. Both of us were much influenced by Jacob Viner, Frank Knight and Henry Simons; Paul also by Aaron Director, Rose's brother who was teaching when Paul was an undergraduate. . . . In 1966, when Henry Hazlitt terminated his role as a regular columnist on Newsweek, the editors of Newsweek decided to replace him with a troika of columnists, choosing Paul Samuelson as a representative of the 'new economics' or 'New Deal' liberal wing of the profession; Henry Wallich as a representative of the large center, and myself as a representative of the 'old liberal' or 'free enterprise' wing. I was very uncertain whether to accept, and one of the things that finally persuaded me to do so was a long telephone conversation with Paul who strongly urged me to agree. For the next fifteen years, until Paul terminated his column in 1981, we both wrote a column once every three weeks and Newsweek proved to be an excellent base for both of us. We

often disagreed on substance but at no time during that period was there any personal disagreement or any personal problem whatsoever. On the contrary, we were mutually supportive" (Szen-berg, Gottesman and Ramrattan 2005, 57).

This journal's editor personal recollection of gratitude is in place. In the early 1970's at the American Economic Association Convention in New Orleans at the John Commons Session, Friedman conferred upon me the Irving Fisher Award for the dissertation, *Economics of the Israeli Diamond Industry,* which was subsequently published (Szen-berg 1973). Paul Samuelson when asked for the secret of receiving so many awards remarked the most important thing is to get the first one. Then the others follow. So it is with publishing. After the first book other publication ventures follow.

In his articles, lectures and books he advanced his unflinching views of the truth with extraordinary vigor, acidulous wit, conviction, and rhetorical flourish. In person, he was charming, passionate and brimming with energy. He was equally strong in the world of ideas and in the world of policy making. With his passing, he leaves a legacy of creative thought to which we may turn for answers to the economic and social questions of the 21st Century.

Note

1. In modal logic, First Order Logic (FOL) is concerned with individuals, economies, or nations (Nolt et al., 1991, 280). A second order logic is concerned with the properties of the individuals. But Propositional Logic (PL) is concerned with sentences that are either true or false (Stebbing 1961, 33).

References

Barro, R. J., and David B. Gordon, "Rules, Discretion, and Reputation in a Model of Monetary Policy," *Journal of Monetary Economics,* 1983, 12, 101–120.

Blanchard, Olivier Jean, and Stanley Fischer, *Lectures on Macroeconomics,* (Cambridge, MA: The MIT Press, 1990)

Boaz, David, *The Libertarian Reader,* (New York: The Free Press, 1997a).

Boaz, David, *Libertarianism: A Primer,* (New York: The Free Press, 1997b).

Bernoulli, D. "Exposition of a New Theory on the Measurement of Risk," (1738), Translated into English by L. Sommers, *Econometrica,* Volume 22, (1954), 23–36.

Bradley, Raymond and Norman Swartz, *Possible Worlds: An Introduction to Logic and its Philosophy,* (Oxford: Blackwell, 1979).

Cagan, Phillip, "The Monetary Dynamics of Hyperinflation," in *Studies in the Quantity Theory of Money,* Milton Friedman, ed. (University of Chicago Press, 1956), 25–117.

Chambernowne, D. G., *Uncertainty and Estimation in Economics,* Vol. 3, (San Francisco, CA.: Holden Day, 1969).

Chari, V. V., and Patrick J. Kehoe, "Modern Macroeconomics in Practice: How Theory Is Shaping Policy," *The Journal of Economic Perspectives,* 2006, 3–28.

Dixon, Keith, *Freedom and Equality: The Moral Basis of Democratic Socialism,* (London: Routledge & Kegan Paul, 1985), 24.

Frazer, William, *The Friedman System: Economic Analysis of Time Series,* (Westport, Conn: Praeger, 1997).

Friedman, Milton and Rose Friedman, *Two Lucky People,* (University of Chicago Press, 1998).

Friedman, Milton and Anna J. Schwartz, "The Effect of Term Structure of Interest Rates on the Demand for Money in the United States, *The Journal of Political Economy,* 90(1), (February 1982), 201–121.

Friedman, Milton and Rose Friedman, *Free to Choose,* (New York: Harcourt, Brace and Jovanovich, 1979).

Friedman, Milton, "Time Perspective in Demand for Money." *Scandinavian Journal of Economics,* 79(4), 1977, 397–416.

Friedman, Milton and Rose Friedman. *Capitalism and Freedom,* (University of Chicago Press, 1962).

Friedman, Milton, *Price Theory,* (Chicago, Ill: Aldine Publishing, 1976).

Friedman, Milton, *The Optimum Quantity of Money and Other Essays,* (Chicago, Ill: Aldine Publishing Company, 1969).

Friedman, Milton., "The Role of Monetary Policy," *American Economic Review,* Vol. 58, (Jan., 1968), 1–17.

Friedman, Milton, "Money: Quantity Theory," in *International Encyclopedia of the Social Sciences.* David L. Sills ed. (The Macmillan Company and The Free Press, 1968), 432–447.

Friedman, Milton and Anna Jacobson Schwartz, *A Monetary History of the United States, 1867– 1960.* (Princeton University Press for the National Bureau of Economic Research), 1963.

Friedman, M. *A Theory of the Consumption Function,* (Princeton University Press, 1957).

Friedman, Milton, "The Quantity Theory of Money—A Restatement," in *Studies in the Quantity Theory of Money,* Milton Friedman, *ed.* (The University of Chicago Press, 1956), 3–21.

Friedman, Milton, "Essays in Positive Economics," (Chicago, Ill.: The University of Chicago Press, 1953).

Friedman, Milton, "A Monetary and Fiscal Framework for Economic Stabilization, *American Economic Review,* 38, 1948, 245–264.

Friedman, Milton, "A Comparison of Alternative Tests of Significance for the Problem of m Rankings," *Annals of Mathematical Statistics,* Volume 11, (March 1940), 82–92.

Friedman, Milton, "The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance," *Journal of the American Statistical Association,* Vol. 32, (December 1937), 675–701.

Friedman, Milton and Rose Friedman, *Tyranny of the Status Quo,* (New York: Harcourt Brace Jovanovich, 1984).

Gilboa, Itzhak and David Schmeidler, *A Theory of Case-Based Decisions,* (Cambridge University Press, 2001).

Gray, John, *Concepts of Social Thought: Liberalism,* (Minneapolis, Minn.: University of Minnesota Press, 1986.

Hayek, F. A., "The Collected Works of F. A. Hayek," Vol. 4, Peter G. Klein ed. (The University of Chicago Press, 1992).

Hayek, F. A., *The Constitution of Liberty,* (Chicago: A Gateway Edition, 1960).

Heller, H. Robert and Moshin S. Khan, "The Demand for Money and the Term Structure of Interest Rates," *The Journal of Political Economy,* 87(1), (February 1979), 109–129.

Heyne, Paul, Peter Boettke, and Davi Prychitko, "The Economic Way of Thinking," (Englewood Cliffs NJ: Prentice Hall, 2003).

Hicks, John R., *The Economics of John Hicks,* Dieter Helm ed., (Oxford: Basil Blackwell, 1984).

Hicks, John R., *Value and Capital,* (Oxford: Clarendon Press, 2nd ed., 1946).

Keynes, John N., *The Scope and Method of Political Economy,* 4th ed., (New York: Kelley and Millman, 1955).

Krugman, Paul, "Who Was Milton Friedman?" *the New York Review of Books,* February 15, 2007, 27–30.

Kydland, Finn E. and Edward C. Prescott, "Rules Rather than Discretion: The Inconsistency of Optimal Plans," *Journal of Political Economy,* 1977, 85(3), 473–492.

Milton Friedman, "The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance," *Journal of the American Statistical Association,* 32(200). (December 1937), pp. 675–701.

Machina, Mark J. and David Schmeidler, *Econometrica,* Vol. 60, No. 4 (July 1992), 745–780.

Mises, Ludwig Von, *Human Action,* (Chicago: Contemporary Books, Inc., 1949, Third Edition 1963).

Modigliani, Franco, *Collected Papers,* Vol. 1. (Cambridge, MA: The MIT Press, 1986).

Modigliani, Franco and Lucas Papademos. "Optimal Demand Policies Against Stagflation," in *The Collected Papers of Franco Modigliani,* Vol. 3, Andrew, A., ed., (Cambridge MA: The MIT Press, 1980), 198–219.

Modigliani, Franco and Lucas Papademos. "Monetary Policy for the coming Quarters—The Conflicting Views," in *The Collected Papers of Franco Modigliani,* Vol. 4, Johnson S. eds., (Cambridge, MA: The MIT Press, 1989), 155–201.

Nolt, Hohn, Dennis Rohatyn and Achille Varzi, *Theory and Problems of Logic.* Second Edition, (New York: Mc Graw-Hill, *Schaum's Outline Series,* 1991).

Papademos, Lucas and Franco Modigliani, "The Supply of Money and the Control of Nominal Income," in *Handbook of Monetary Economics,* Vol. I, B. M. Friedman and F. H. Hahn, eds., (Amsterdam: North-Holland, 1990), 399–494.

Phelps, Edmund S., "Phillips Curves, Expectations of Inflation, and Optimal Unemployment over

Time," *Economica,* Volume 34, (August, 1967), pp. 254–281.

Rothbard, Murray N., "Praxeology as the Method of Economics," in Maurice Natanson, ed. *Phenomenology and the Social Sciences,* Vol. 2, (Evanston Ill: Northwestern University Press, 1973), 311–339.

Rothbard, Murray N., *Man, Economy, and State: A Treatise on Economic Principles,* (LA: Nash Publishing, 1970).

Rothbard, Murray N. "Praxeology: Reply to Mr. Schuller," *American Economic Review,* Vol. 41(5) (Dec., 1951), 943–946.

Samuelson, Paul A., *The Collected Scientific Papers of Paul A. Samuelson,* Edited by Kate Crowley ed., Vol. 5, (Cambridge, MA: The MIT Press, 1986).

Samuelson, Paul A., "An Interview with Paul A. Samuelson," in Paul A. Samuelson and William A. Barnett eds. *Inside the Economist's Mind: Conversations with Eminent Economists,* (Oxford: Blackwell Publishing, 2007), 143–164.

Savage, Leonard J., *The Foundation of Statistics,* (New York: Dover Publications, 1972).

Simons, Henry C., 1936, "Rules versus Authorities in Monetary Policy," *The Journal of Political Economy,* 44(1), 1–30.

Stebbing, L. Susan, *A Modern Introduction to Logic,* (New York: Harper TorchBooks, 1961).

Szenberg, Michael, 1973, *Economics of the Israeli Diamond Industry* with an Introduction by Milton Friedman. Awarded the 1971 Irving Fisher Prize. The Final Selection Committee consisted of Maurice Allais, Kenneth Boulding, Milton Friedman, Paul Samuelson and Egon Neuberger, (New York: Basic Books 1973).

Szenberg, Michael, Aron Gottesman and Lall Ramrattan, *Paul Samuelson, On Being an Economist* with a Foreword by Joseph E. Stiglitz, (New York: Jorge Pinto Books, 2005).

Szenberg, Michael, Lall Ramrattan and Aron Gottesman, eds., *Samuelsonian Economics and the Twenty-First Century* with a Foreword by Kenneth J. Arrow, (Oxford University Press, 2006).