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Discussion and Comments on "Economic Implications of Extraordinary Moments in Stock Prices"

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Comments and Discussion

Hyman P. Minsky: As Benjamin M. Friedman and David I. Laibson recognize, their paper, which initially focuses on stock prices and offers a model to explain their excessive volatility, has a relevance that extends beyond the behavior of stock prices. In particular, their paper instructs us on how to investigate complex processes that have some components whose impact is felt quickly and others whose impact is delayed while variables cumulate—that is, as the environment changes. One way the Friedman-Laibson insight for the explanation of excessive volatility of stock prices can be extended is by transforming it into an explanation of the historical pattern of mild and deep business cycles. To do so, it is necessary to specify what cumulates, why such cumulation takes place, and how such cumulation changes the environment so that deeper cycles can be triggered. Once such cumulative processes are identified, it is possible to specify both what happens during the deeper cycles and the economic relations that can contain such deeper cycles.

Friedman and Laibson observe that the historical volatility in stock prices is too great to be ascribed to processes of the type that give rise to a "normal" distribution. Because the prices of stocks that are traded on exchanges can be adapted to be used as proxies for the prices of real capital assets, that observation can be extended to support the proposition that the volatility in the market valuation not only of financial assets but also of capital assets as collected in firms is too great to be ascribed to random errors. What is needed is a construct that accounts for the excessive richness of the tails of the distribution.

Friedman and Laibson provide such a construct. They posit that two processes generate stock prices and, by the extension they draw in the section titled "Market Fluctuations and Macroeconomic Fluctuations,"

the business cycles of experience. One is a random error process that would generate a nice bell-shaped distribution if it were the only process operating.[1]

The other is a Poisson process that kicks in from time to time with a large displacement. Friedman and Laibson identify large negative displacements of stock prices as crashes.

Friedman and Laibson tie their work into what they call "Hyman Minsky's 'financial instability hypothesis,' " which holds that cumulative changes in the financial structure—mainly in the liabilities used to finance positions in assets but also in the assets and liabilities acceptable in portfolios—take place over a run of good times. As a result, an originally robust financial structure, one characterized by hedge finance (as in 1946), is transformed into a fragile one, one characterized by substantial speculative and Ponzi finance (much as we see today). The hypothesis grew out of my efforts to explain the pattern of mild and severe recessions-depressions noted by Joseph Schumpeter, Milton Friedman and Anna Schwartz, and Moses Abramovitz.[2] My work linked the difference between mild and serious recessions to the robustness or fragility of the financial structure and the large reactions to small proximate stimuli that take place in fragile structures. I argued that the behavior of profit-seeking units over a run of good times transforms the financial structure from being robust to being fragile, so that crises, financial disturbances, and debt deflations, which characterize a deep depression cycle, can take place.[3]

I appreciate that Friedman and Laibson link their detailed, innovative, and sophisticated work to ideas I put forth in various forms over the past thirty years. I want to take the opportunity afforded by their paper to enlarge upon what I now, long after the initial labeling of a particular interpretation of experience and literature as the financial instability hypothesis, mean by the financial instability hypothesis. In particular, I want to examine whether the hypothesis was advanced, as Friedman and Laibson put it, "with less than explicit grounding in the theory of economic behavior" and to address the question posed by Friedman

1. This might well be a Frisch-Slutsky process like the one with which Milton Friedman and Robert Lucas worked. See Frisch (1933); Slutsky (1937); Friedman (1968); Lucas (1972).

2. Schumpeter (1939); Friedman and Schwartz (1963); Abramovitz (1959).

3. Minsky (1964)

and Laibson about "the relevant actors in the economy" who "change their behavior so as to erode the financial system's ability to withstand a major shock without sustaining a rupture of the kind typically associated with a severe downturn in real output and spending."

I used the phrase "the financial instability hypothesis" to describe a deviant interpretation of Keynes's *General Theory* that I advanced in a book, *John Maynard Keynes*.[4] I characterized Keynes's *General Theory* as advancing an investment theory of business cycles and a financial theory of investment. I also hypothesized that Keynes was familiar with Irving Fisher's "Debt Deflation Theory of Great Depressions" and that some of the special results of the *General Theory* dealt with the effect of a debt deflation upon objective conditions facing businessmen and bankers and the way they view the world.[5] As a result, a debt deflation or even a less dramatic financial crisis affects the investment, financing, and employment decisions businessmen and bankers make.

The two price levels of a capitalist economy that are relevant to the financial instability view are the price level of capital assets and the price level of labor or, equivalently, of current output. In the famous rebuttal to Professor Viner, and in other post–*General Theory* arguments, Keynes identified liquidity preference as the determinant of the price level of capital assets, what I have usually called P_k.[6] Investment is determined by the gap between the price level of capital and financial assets, P_k, and the price level of investment output, P_i, along with financing conditions that integrate internal financing with the attitude toward risktaking of the proximate borrowers and lenders at the time investment, asset acquisition, and financing decisions are made.[7]

Keynes argued in chapter 17 of the *General Theory* that the return from holding any asset can be treated as being determined by three factors: q, the yield of the asset; c, the carrying costs of the asset; and l, the liquidity premium. I stretched Keynes's argument to include the cash payment commitments that are embodied in the contracts used to finance positions in financial and capital assets in the carrying costs, the

4. Minsky (1975).

5. Fisher (1933).

6. Viner (1936); Keynes (1937); Keynes (1946). Viner identified Keynes's liquidity preference as a demand for money relation with the interest rate as an argument. Keynes emphatically rejected that interpretation.

7. Minsky (1975, chap. 5).

c's. This made the q's and the c's cash flows. The q's were expected gross profits and the c's were contractual payment commitments that reflected market conditions and expectations that ruled when the contracts were signed. To be more specific, the c's due at any time were the result of earlier negotiations between businessmen and bankers. They embody the expectations about profits and financing conditions that these agents held when the contracts that determine today's payments were negotiated. Financial commitments, along with the economy's inherited capital assets, labor force, and rules that guide institutional behavior, are legacies of the past that limit what can be done in the present.

The l return that assets earn is subjective. It represents the value of being insured against contingencies that can make a unit unable to purchase, hire, or fulfill payment commitments. Money is an asset that derives its value from its ability to discharge financial commitments and from the ability to purchase and to maneuver that it bestows upon those who hold it. The price of a unit of money is always l, and the money prices of assets that yield mainly $q - c$ rise and fall as the quantity of assets that yield mainly l rise and fall and as the subjective value put on l falls and rises. Keynes is interpreted as proposing a quantity-and-quality-of-money explanation of asset prices.[8]

This Keynes q, c, and l construct yields the prices of individual capital and financial assets as well as capital assets collected in bundles as firms. The market prices of firms at every date place values on intangibles, such as market position or power, and reflect the auras of optimism or pessimism about the future that are assigned to firms, industries, and economies.[9]

The Keynes model of a capitalist economy is driven by both objective developments and subjective expectations. The value of liquidity, in the form of the holding of a stock of money or of assets that are taken to be readily transformed into money, depends upon the adequacy and the reliability of the cash flows from income generation that are expected to

8. This is wedded to a money wage cost explanation of output prices. Ferri and Minsky (1984).

9. The pricing of individual firms and assets presents no particular conceptual problems. The derivation of the index number, the price level of capital assets, P_k, is fraught with conceptual difficulties. However, there is always the Dow Jones and the Standard and Poor indexes to fall back on.

be available to fulfill each period's current payment commitments and the expected performance of the markets in which units exchange assets that are held in a portfolio for money. The value of liquidity depends on the expected performance of aggregate cash flows (profits) and the expected likelihood that financial markets may be disrupted.

The contracts that are closed on any day reflect both the extent to which current and recent q's were available to fulfill the c's, for both the economy as a whole and the particular units that are negotiating contracts, and what the model of the economy that helps form the expectations of the negotiating units tells them about the future of the q's and the c's. The principal actors in creating financial contracts are bankers and businessmen: the analytical core of the financial instability hypothesis is a model of banker-businessman negotiations. The banker-businessman negotiations that lead to the financing of investment activity are the proximate determinants of income, profits, and employment. Each participant in such negotiations has private information as well as its own market power.[10]

Because the financial instability hypothesis was formulated before the current fashion of formally reducing aggregate behavior to stylized unit behavior took hold, it was not reduced to a formal model based on representative agents with asymmetric information. The task of a "modern" modeling of the phenomena that are critical to the financial instability hypothesis remains undone. The emphasis on the value of l and expected q's as determinants of the price level of capital assets means that the model of the economy used by the relevant agents (businessmen, bankers, and managers of money) in forming their expectations is of vital importance.

The financial instability hypothesis assumes that the models of system performance that help form the expectations of businessmen and bankers are affected by the recent performance of the economy and by agents' knowledge of its more remote past. The critical agents are unsure how the economy will perform, because they are unsure of the effect of recent institutional and environmental changes. As a result, businessmen, bankers, and managers of money may markedly—and unpredictably—change their behavior in response to small changes in system behavior,

10. William Janeway, an investment banker, stated what I call Janeway's first law: "Entrepreneurs lie." A banker's cliché is "I've never seen a pro forma I didn't like."

if the changes affect their belief in, or the structure of, the model of the economy they use to form expectations.

Agents know that there have been financial crises and deep depressions in the past. Legislative and administrative changes have taken place since the last crisis and depression, in part as a reaction to crises and depression. In addition, market-driven institutional and usage changes have taken place. Furthermore the structure of financing relations undergoes systematic changes as success breeds optimism about future success. The model that guides expectation formation is more volatile than the constructs that rely on the decay of the impact of a previous crisis or depression or on some universally valid model of system behavior. Furthermore, as Keynes noted, changes in the model that underlies expectation formation need not proceed at the same pace for different agents or classes of agents.

Every agent has three sources of liquidity: cash flows from operations (gross profits for business, wages for households, taxes for governments), contract realizations, and portfolio adjustments. The importance of liquidity in the form of monetary and marketable assets diminishes whenever the felt assurance of units (bankers and businessmen, mainly) of the cash flow from operations and from contract fulfillment increases. The success of policy in preventing any sharp and sustained drop in gross business profits over the postwar period has decreased the importance of liquidity in the form of asset holdings. This decline in the subjective yield of liquidity from assets has led to increases in the prices of assets that are valued mainly for the cash they are expected to yield and increases in the payment commitments that income flows are deemed capable of sustaining. The diminished importance attached to portfolio liquidity has helped sustain business investment and consumer debt-financed spending during recent financial traumas that in other circumstances may well have disrupted income flows.

Two views—first, that sustaining aggregate business profits is the key variable for successful stabilization policy and, second, that the composition of aggregate demand rather than any intrinsic productivity of capital-determined profits—are joined to the q, c, l view of asset values in the financial instability hypothesis. The Kalecki perspective on the national accounts, which emphasizes income distribution and in particular the way in which profits are related to investment and the government deficit, is a fruitful way to approach public policy issues in a world where

the success or failure to validate debt in each period is a significant determinant of the behavior of the economy.

The emphasis in Friedman and Laibson's empirical work is on the choice of assets for a portfolio. I suggest that a shift of research emphasis to the liabilities used to finance positions in assets is warranted. The same considerations—the erosion of portfolio conservatism, agents' unsureness of the significance of novel usages and institutions, beliefs that this is a new era, and the other factors that lead to the bidding up of equity prices by the representative household and its agents—apply to the decisionmakers in both ordinary business firms (the proximate owners of the economy's capital assets) and the complex of financial institutions that are the main proximate owners of the liabilities issued by ordinary firms.

One reason for shifting to an argument based upon liability structures is that the ruling pattern, of cash in from operating in the economy and cash out committed by liability structures, determines the vulnerability of the financial system to disruptive movements, the vulnerability of the economy to deep depressions, and the need for intervention by central banks and governments to contain crises and depressions. Furthermore, the argument about the pattern of income receipts and contractual payment commitments for business firms can be extended to include households, domestic government debt, and international financial arrangements.

The language I use—hedge, speculative, and Ponzi—to describe financial structures has put some off. In a hedge financial structure, the expected "cash flows in" exceed the "cash payment commitments" on the account of both principal and interest as far ahead as a reasonable person looks. A hedge financing unit is likely to have a high ratio of equity to debt. In speculative or rollover financing, the net income portion of gross cash flow exceeds the interest payments committed, but the cash flows are insufficient to meet the payments commitments on principal. Banks are speculative financing units, as is any firm that finances holdings of long-lived assets with short-term debt. Such organizations speculate that refinancing will be available on reasonable terms and are vulnerable to disruptions in financial markets. Ponzi finance—and I have been criticized for using the name of a Boston swindler for what is a not uncommon and often legitimate business practice—takes place when cash flows are not sufficient to pay the interest due on debt

and the interest is folded into the principal owed. If Ponzi finance is not used to finance long-gestation investments, then it amounts to decreasing the equity account even as indebtedness increases. Ponzi finance has a natural termination point when equity goes negative, but all too often creative accounting obscures this transformation.

The "Minsky" hypothesis can be stated in terms of the hedge, speculative, and Ponzi characterization of financing postures. Over a period of good times liability structures change so that the weight of hedge financing units decreases and the weight of speculative and Ponzi financing units increases. Note that any change toward a conservative view of what constitutes an apt liability structure for holding capital assets will put pressure on firms that are in speculative and Ponzi financing postures to use their cash flows to clean up their balance sheets: to use retained earnings to retire debt rather than as the basis for leveraged investment. In addition speculative and Ponzi debtors may be constrained to sell assets to improve their balance sheets. Such making of position by selling position can well lead to a fall in the price of assets being offered. As a result a smaller amount of cash than the books indicated will be generated. If the process is not aborted by the Federal Reserve or some similar agency the price level of assets can fall sharply. This can lead to a broad erosion of mark-to-market net worths and to a decline in the ability to finance investment. As a result investment falls and so will aggregate business profits.[11]

In a big-government capitalism, the impact on profits of a decline in investment is offset by an increase in the government deficit, which is a plus for business profits. Once business profits are sustained, the collapse scenario of asset prices that characterizes a deep depression will not be acted out. Modeling liability structures and integrating such structures with asset pricing is a key to understanding the dynamics of intensely financial capitalist economies.

In their closing remarks Friedman and Laibson note that there is a contradiction in the Minsky hypothesis in that even as the agents themselves view a deep depression or financial crisis as being less likely, the objective portfolio postures tend to make a depression or crisis more

11. In a small-government capitalism with a central bank constrained by rules, this dynamic could lead to serious depressions. It is worth recalling that the Federal Reserve was constrained by rules about gold reserves and the special place of discounted paper during the great collapse of 1929–33.

likely.[12] This apparent paradox, which I believe I usually noted, is resolved by pointing out that the interval over which debt is built up, thus making the objective conditions more favorable to a crisis, is long enough for substantial changes in institutions to have occurred. In addition, claims that more is known now than earlier and that policy is wiser now than in the past gain credence and affect expectations about system performance. Expectation formation takes into account that "The world has changed" and that "They won't let it happen," even though agents are not sure who "they" are and what "they" will do. Even as agents note the unfavorable objective circumstances, their significance for today is discounted.[13]

To return to Friedman and Laibson's comments about the Minsky hypothesis, the financial instability model focuses on the behavior of the proximate agents, businessmen and bankers, who determine investment activity. The model does not reduce the agents of the economy to some ultimate units such as households that aim to maximize the present value of consumption flows.

In the financial instability hypothesis the cumulating process that transforms a system that is virtually immune to deep and serious depressions into one that is susceptible to such depressions results from decisions made by businessmen who invest and finance positions in capital assets, by bankers (commercial and investment) who arrange financing and take positions in assets, and by money managers who have views about the appropriate liability structure for financing positions in capital and financial assets and investment. Each unit in these classes of agents bases its decisions on current constraints—legacies from the past that are more or less constraining—and expectations of the future—mainly expectations about profits and the way financial markets will function. The model of the economy that guides expectation formation recognizes that serious depressions have occurred. Furthermore, agents are not sure that their model has got the economy quite right. As a result a sharp change in the model used in expectation formation can be induced by events.

According to the financial instability hypothesis, the relevant agents are rational and calculating, but they recognize that the world in which

12. Abba Lerner accurately characterized my view as "Stability is destabilizing."
13. Giordano (1989).

they live is irrational or at least not fully rational. Agents recognize that the model of the economy they use cannot explain the evolution of the economy through time nor predict the impact of novel institutions. It is the uncertain knowledge underlying the model used to form expectations that makes it possible for large repercussions to follow from small events. An occasional downside displacement, such as Friedman and Laibson model as a Poisson distribution, becomes a systemic or endogenous event when it takes place as a result of heavily indebted liability structures and when the model of the economy held by agents changes in response to such a displacement so as to amplify the initial displacement.

In today's world large governments effectively prevent a collapse of profits and central banks intervene to assure that during situations of potential crisis not only banks but also other units that may otherwise be forced to make position by trying to sell position are refinanced. These two sets of interventions have successfully contained the aggregate reactions to the sometimes serious financial crises of the past decades.[14]

The combination of a financial environment that evolves and expectations that change rapidly has been behind the deep depressions of history. As we look back on the 1980s we may at first glance see a long expansion after 1982, but we should also see the regular central bank interventions (I include the refinancing of the savings and loans as a central bank intervention) and the government deficits that underwrote aggregate profits. This combination has to date contained the impact of the financial crisis and rapid changes in asset values such as the stock market crashes of 1987 and 1989. Nevertheless, it is clear that the processes that made for deep depressions in capitalist economies, which Friedman and Laibson help us understand, are alive and well: only their effect has been contained.

General Discussion

A number of panelists criticized specific features of the authors' model, including the statistical process assumed to govern stock returns and the way investors are assumed to use historical data in making

14. This is the main policy theme of Minsky (1986).

portfolio decisions. Christopher Sims argued that the model makes too sharp a distinction between big shocks and normal shocks. As a result the authors fail to identify three other shocks in the postwar period, one negative and two positive, that would be characterized as extraordinary shocks under a more flexible parameterization. Steven Durlauf reasoned that the authors should have allowed for the possibility of correlation between the normal and the extraordinary component of stock prices and then tested for the null hypothesis of no correlation. Charles Holt suggested the possibility of explaining the special features of the distribution of stock returns by making use of recent work in chaos theory. Sims observed that historical data do not do a good job of discriminating among the wide variety of statistical models that have been advocated by different investigators. Hence, he argued, the rational expectations assumption that there is a true stochastic process, and that everyone knows it, is not sensible. He suggested that research be directed toward models in which market participants are not sure of the underlying stochastic process and have different views about it.

Robert Hall noted that the authors assume that an investor's estimation of the underlying parameters of the stochastic returns process is made separately from his decision about optimal portfolio shares. He suggested assuming that investors integrate their estimation and decision problems. In the two-step process, investors use the estimated parameters as if they were known with certainty when they make their investment decisions. A one-step procedure would take account of the uncertainty in the parameter estimates. Sims thought that such a Bayesian procedure might alter radically predictions about investor behavior. Because the extraordinary shocks are so rare and uncertainty about the probability of their occurring so high, investors might act very "conservatively" and not make big shifts in their portfolios after one of the infrequent large shocks to market prices. This would be qualitatively different behavior from that predicted by the authors' model. William Poole commented that the nonnormality of the distribution of stock prices reinforces the importance of diversification in portfolios. With "fat-tailed" distributions, the gains from diversification, both among stocks and between stocks and other assets, are even greater than in the case of normally distributed returns.

George Akerlof directed attention to the paper's economic model of investor behavior, and questioned the assumption that expected returns

in the bond market are constant and therefore unaffected by a stock market crash. The increased estimate of risk after a crash would result in portfolio shifts toward bonds and therefore to further declines in stock prices as aftershocks. This is contrary to what happened in the crash of October 1987, which was followed by stock price increases instead. Benjamin Friedman responded that the model could be modified to include debt securities bearing default premiums. Historically, after a stock market crash precipitated by extensive defaults, the default premiums become large for a while and eventually fall to normal levels. This process could actually generate subsequent stock price changes as "aftershocks." In the same vein, Matthew Shapiro thought more attention should be paid to the equilibrium requirement that the demand for and supplies of stocks be equal. He noted that in the authors' model, stock is demanded as a proportion of wealth, and is affected by changes in expected return following a crash. After a decline in stock prices, the share of stocks in wealth has decreased, so investors will try to rebalance their portfolios. These movements in demand are certainly important for determining stock prices, but they are excluded from the model.

A number of comments were made about the implications of the paper for bubble theories of the stock market. If the market rides on positive bubbles that occasionally burst, the model predicts periods of zero autocorrelation of returns, with large negative deviations at infrequent intervals. Hence, Durlauf interpreted the positive serial correlation in the normal component of stock prices as evidence against bubbles. George von Furstenberg, by contrast, suggested that the paper helped rationalize bubbles. The estimated probability that the stock market will crash tends to decline as time passes after a crash. The decline in probability of the bubble's bursting combined with an increasing size of the bubble is consistent with constant rationally expected returns.

Several panelists were disappointed that the paper did not have more to say about the causes of large and abrupt movements in the market, which are treated simply as random events in the basic model. Friedman said that a specific explanation of big market movements, especially in the context of the Minsky hypothesis, would entail examining other economic variables such as accumulated liabilities together with stock prices. It is hard to identify specific events that cause collapses, but the Minsky hypothesis is that collapses happen only when there is an excessive accumulation of liabilities. The intended treatment in this

paper is more general, allowing for collapses due to excessive liability accumulation or to "bursting bubbles" or to Shiller-type "epidemics"; but there is clearly a price to be paid for that generality. James Duesenberry argued for the importance of looking at "fundamental" variables in addition to looking at the market's own behavior, suggesting that changes in investors' views about future inflation and interest rates and earnings are central to an explanation of market movements. Shapiro contrasted the authors' description of crashes with Fischer Black's view of the recent crash. According to Black, the crash was caused by a flight to safety—a sudden decline in the demand for risky assets—that caused the change in stock prices, and not the other way around. The price level and the volatility of returns should be treated simultaneously.

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