The Stock Market Bubble of 1929: Evidence from Closed-end Mutual Funds

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Economists directly observe warranted "fundamental" values in only a few cases. One is that of closed-end mutual funds: their fundamental value is simply the current market value of the securities that make up their portfolios. We use the difference between prices and net asset values of closed-end mutual funds at the end of the 1920s to estimate the degree to which the stock market was overvalued on the eve of the 1929 crash. We conclude that the stocks making up the S & P composite were priced at least 30 percent above fundamentals in late summer, 1929.

I. INTRODUCTION

The sharp rise and subsequent crash of stock prices in 1929 is perhaps the most striking episode in the history of American financial markets. The nominal Standard and Poor's (S & P) composite index rose 64 percent between January 1928 and September 1929, fell 33 percent between September and December 1929, recovered about halfway to its 1929 peak, and then fell again to a low point in the summer of 1932: 66 percent below its December 1929 level and 77 percent below its September 1929 average (see Figure 1).[1]

Some observers have interpreted this price pattern as reflecting changing fundamentals in the economy. Irving Fisher, for example, argued throughout 1929 and 1930 that the high level of prices in 1929 reflected an expectation that future corporate cash flows would be very high.[2] Fisher believed this expectation to be warranted after a decade of steadily increasing earnings and dividends, rapidly improving technologies, and monetary stability. According to this interpretation, the runup of stock prices before the crash reflected shifts in expectations of the future that were *ex post* faulty but *ex ante* rational. The crash and

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[1] The Standard and Poor's composite index is taken from the 1984 *Securities Price Index Record*, p. 4. Its source is table P-1 of Cowles, *Common Stock Indices*.

[2] See Fisher, *The Stock Market Crash*, in which he defended his belief that the market had not been significantly overvalued in the fall of 1929. Fisher is most often cited and ridiculed for his statement in the fall of 1929 that "stock prices have reached what looks like a permanently high plateau." See Galbraith, *Great Crash*, p. 75.

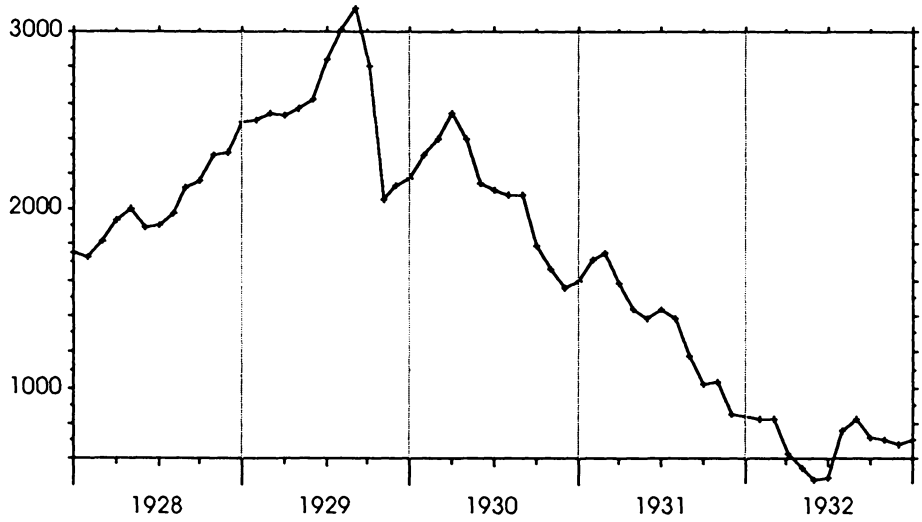

FIGURE 1

THE NOMINAL S & P COMPOSITE STOCK PRICE INDEX, 1928–1932 (1941–1943 = 1000)

Source: Cowles, *Common Stock Indices*, table P-1.

the subsequent slide of stock prices then reflected a rational, and in this case an *ex post* correct, revision of beliefs, as investors recognized the approach of the Great Depression and the end of the Roaring Twenties.

Other students of the Great Crash, notably J. K. Galbraith, have argued that even though fundamentals appeared high in 1929, the stock market rise was clearly excessive. Galbraith cited margin buying, the formation of closed-end investment trusts, the transformation of financiers into celebrities, and other qualitative signs of euphoria to support his view.[3] Over the past three decades, Galbraith's position has lost ground with economists, especially with financial economists, as the efficient-market hypothesis has gained.

Much recent work sides with Fisher's interpretation of 1929. Sirkin, for example, examined the revisions of long-run growth forecasts required for shifts in stock yields in 1929 to reflect shifts in perceived fundamental values. He found that, compared to actual post–World War II yields and stock returns, the implied growth rates of dividends were quite conservative, and in fact lower than post–World War II dividend growth rates.[4] Santoni and Dwyer failed to find evidence of a bubble in stock prices in 1929.[5] Along similar lines, Barsky and De Long argued that, if the long-run growth rate of dividends were thought to be unstable and if investors projected recent-past dividend growth rates into the future, then large swings in stock prices, such as those of the 1920s and

[3] Galbraith, *Great Crash*, especially pp. 6–28 and 71–92.

[4] Sirkin, "The Stock Market of 1929 Revisited."

[5] Santoni and Dwyer, "Bubbles vs. Fundamentals."

1930s, would be the rule rather than the exception. Barsky and De Long found that year-to-year movements in stock prices appear to have been no more sensitive to changes in current real dividends in the late 1920s and early 1930s than in the remainder of the twentieth century.[6]

Leaning to the other side is White, who in a series of papers cited "qualitative evidence . . . [that] favors the view that a bubble was present," but cautioned that "[t]he failure of dividends to keep pace with stock prices does not . . . necessarily imply the existence of a bubble"; he thought it unlikely at the time of his writing that convincing quantitative estimates of overvaluation could be made.[7] Rappoport and White have recently made quantitative estimates of the size of the overvaluation in 1929 comparable to those made here.[8]

In this article we present evidence that a substantial component of the rise in stock prices up to and fall of stock prices away from September 1929 was in fact excessive and not based on rational revisions of warranted valuations. Our evidence is based on an analysis of the prices, discounts from net asset values, and new issue volumes of closed-end mutual funds during and after 1929. We estimate that at the peak the stock index was more than one-third above its fundamental value. Using a different source of information—the interest rates charged on brokers' loans—Rappoport and White got a similar estimate: under the assumption that lenders were risk neutral, they calculated that, at the market's peak, banks making brokers' loans thought the market was overvalued by perhaps one-half.

Earlier work by De Long, Shleifer, Summers, and Waldmann and by Lee, Shleifer, and Thaler focused on closed-end funds as a measure of the sentiment of individual investors.[9] Closed-end funds do not give investors direct claims on the assets of the fund. Investors desiring to liquidate cannot return their shares to the fund and trigger a partial liquidation of its portfolio, but must instead sell their shares to other investors. Because a closed-end fund is a company that has shares of other companies, its fundamental value can be measured exactly: it is the market value of the securities it holds—the net asset value.

[6] Barsky and De Long, "Bull and Bear Markets"; and Barsky and De Long, "Why Have Stock Prices Fluctuated?" Note that Barsky and De Long could not say that the stock market did not overreact to events in the 1920s—all they could say was that the degree of overreaction appeared no greater in the 1920s and 1930s than in other periods. In addition, Barsky and De Long examined the market's level in successive Januaries only. As a result, their procedures completely miss the 25 percent runup and then 30 percent crash of the S & P index in calendar year 1929.

[7] White, "When the Ticker Ran Late"; and White, "The Stock Market Boom and Crash of 1929 Revisited," pp. 67–83.

[8] Rappoport and White, "Was There a Bubble in the 1929 Stock Market?" They noted that lenders in the call-loan market in 1929 were demanding very high interest rates on loans secured by stocks, and that lenders in the call-loan market at least saw a significant chance *ex ante* of a large stock market crash in 1929.

[9] De Long et al., "Noise Trader Risk," pp. 703–38; Lee et al., "Investor Sentiment"; also see Lee et al., "Anomalies: Closed-End Mutual Funds," pp. 153–62.

It is well known that closed-end funds sell for prices that often differ from their net asset values. In fact, in the post–World War II period, funds have tended to sell at a discount from their net asset values.[10] De Long et al. presented a theory of the pricing of closed-end funds in which the discount on those funds was a measure of an irrational investor sentiment factor. Lee et al. also presented some evidence consistent with this theory.

Let us begin with the assumption that these discounts on closed-end funds are a measure of the sentiment of individual investors toward stocks; we can then investigate whether stock prices in 1929 were excessive. We estimate that about a fifth of the runup in stock prices from 1927 to 1929 and about half of the fall in stock prices from 1929 to 1931 were the result of shifts in irrational investor sentiment instead of rational revisions of estimates of fundamental values.

Our conclusion is based on three pieces of evidence. First, the median closed-end fund premium in the third quarter of 1929 was about 50 percent. Such high premia on average have not since been achieved in the United States. Second, new closed-end fund issues in the third quarter of 1929 reached their highest level ever; according to the *Commercial and Financial Chronicle*, they amounted to $1 billion during August and September 1929. This amount was equivalent in purchasing power to perhaps $9 billion today and bore the same proportion to the U.S. economy then that $55 billion would bear today. In the theory of De Long et al., both high premia and large volumes of new closed-end fund issues are evidence of excessive investor optimism.

Our third piece of evidence uses the observation of Lee et al. that closed-end fund premia reflected the sentiment of *individual* investors. In the 1920s institutional investors barely existed, and individual investors dominated the holding and trading of all stocks. Individual investor sentiment should then have affected both closed-end fund premia and stock prices. In fact, during that period changes in the median discount on closed-end funds were strongly correlated with changes in stock prices.

We take this evidence further by constructing an alternative measure of investor sentiment equal to the difference between the S & P stock index and an estimate of fundamentals from Barsky and De Long. Barsky and De Long's assumptions about fundamentals were designed to make "fundamentals" as volatile as possible. The Barsky–De Long framework provided for a larger increase in warranted fundamental values in 1929 than did other available models of the stock market.[11] Yet their measure was not a perfect fit, and substantial deviations of actual

[10] Malkiel, *Random Walk*, pp. 260–64.

[11] For example, those found in Shiller, *Market Volatility*, pp. 661–76.

prices from the Barsky and De Long warranted values remain. We demonstrate that those deviations are closely correlated with the average premium or discount on closed-end funds. The measure of sentiment from closed-end funds is not only correlated with stock prices but also closely parallels an *independently constructed* measure of sentiment derived from Barsky and De Long. This evidence corroborates the interpretation of 1929 stock prices as reflecting in part excessive investor optimism.

The next section briefly reviews earlier work that used closed-end fund discounts as a measure of investor sentiment. The third section presents our evidence on closed-end fund discounts. The fourth section analyzes the correlation between the median closed-end fund discount and stock prices relative to "fundamentals." The fifth section briefly addresses the question of whether the bubble of 1929 had an effect on the real economy, and the sixth concludes.

II. DISCOUNTS ON CLOSED-END FUNDS AS A MEASURE OF INVESTOR SENTIMENT

The closed-end fund anomaly refers to the empirical finding that closed-end mutual funds often trade at prices substantially different from their net asset values: that is, the market value of the securities they hold.[12] When they are issued, closed-end funds typically sell at premia to net asset values. Without such premia, funds could not be organized without a loss to the organizers. But within months after issue in the post–World War II period, fund share prices typically moved to discounts to net asset values. These discounts to net asset values fluctuate over time, and changes in discounts are strongly correlated across funds. Occasionally discounts turn into premia. By and large, funds in the post–World War II period have sold at less than the market value of their holdings, with the median fund fluctuating between a premium of 5 and a discount of 25 percent.[13] Figure 2, using data from Lee et al., plots post–World War II premia and discounts for closed-end funds.

Many standard-efficient-markets hypothesis-based explanations of the closed-end fund puzzle, such as illiquidity, taxes, and agency costs, have been shown to be inconsistent with the data.[14] De Long et al. offer an alternative explanation of the puzzle that is not consistent with efficient markets. In their model there are two types of investors: noise

[12] Successive editions of Malkiel, *Random Walk*, have argued for nearly two decades that closed-end funds are, when selling at "normal" discounts, attractive investment vehicles. The relevant passage is on pp. 260–64 of the 1975 edition (the subsection headed "Fund Step 3. Buy closed-end funds whenever they are selling well below their average historical discounts").

[13] See Lee et al., "Investor Sentiment."

[14] Lee et al., in "Investor Sentiment," provide reasons for rejecting these alternative attempts at explaining closed-end fund discounts.

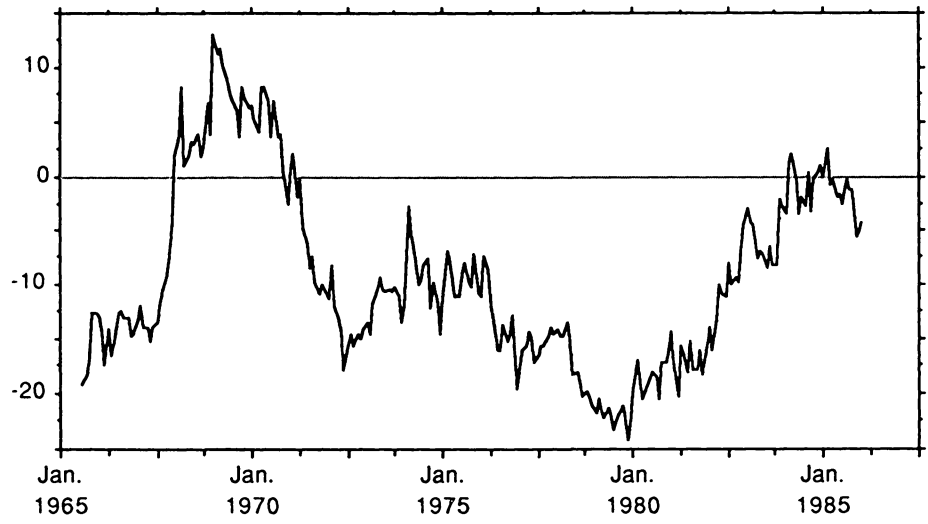

FIGURE 2

POST–WORLD WAR II MEDIAN PREMIA AND DISCOUNTS ON CLOSED-END FUNDS, IN PERCENTAGE POINTS

Source: Data provided by Lee et al.

traders, whose demand is determined in part by irrational changes in their sentiment toward some securities, including closed-end funds; and rational investors, who are not influenced by irrational sentiment factors. In the case of closed-end funds, noise traders are probably the individual investors who hold and trade most of the funds' shares. When noise traders are optimistic, they increase their holdings. Rational investors accommodate this demand, reduce their own holdings, and if necessary go short. Noise trader optimism drives up the prices of closed-end funds relative to their net asset values, and discounts shrink or turn into premia. Conversely, noise trader pessimism causes them to reduce their holdings of the funds and other assets they trade. Because rational investors must hold more of the funds and bear more investor sentiment risk, they require higher expected returns and hence cause the discounts to widen.

For this theory to hold together, arbitrage by rational investors must not eliminate the discounts on closed-end funds. Why don't rational investors buy funds selling at discounts, sell short their underlying portfolios, and ensure themselves a perfectly hedged profit? De Long et al. attribute the failure of arbitrage to the unpredictability of changes in investor sentiment and to the finite horizons of rational investors. An investor who buys a fund and shorts its portfolio runs the risk that, at the time he liquidates his position, sentiment about funds will have become more negative, causing his attempted arbitrage trade to result in a loss. This risk from changes in investor sentiment keeps rational

investors from trading to eliminate the discounts. However, it deters arbitrage only if it affects the prices of a large number of securities and thus cannot itself be hedged. Investor sentiment risk must therefore be systematic for the theory to hold. And if it is systematic, it will be priced in equilibrium.

Some implications of this theory of closed-end fund discounts were examined by Lee et al. First, investor sentiment imposes an additional factor of risk on holdings of closed-end funds that investors must be compensated for bearing. In other words, closed-end funds must on average sell at a discount to their net asset values, which is indeed the case. Second, for the investor sentiment factor to be priced it must affect all closed-end funds, so discounts on funds must fluctuate together. Lee et al. have documented this for U.S. funds since 1960. Third, the theory predicts that new closed-end funds will be started when noise traders are excessively bullish about some set of assets including the funds and are therefore willing to buy bundles of assets at a premium over net asset value. Rational investors start closed-end funds when they can sell overpriced bundles of assets to people who overvalue them. Lee et al. found that new funds do start (at a premium, of course) when seasoned funds sell at premia or at discounts that are small by historical standards.

The final, and perhaps the least obvious, prediction of the theory is that there must be securities other than closed-end funds that are affected by the same *systematic* investor sentiment factor. If this were not the case, investor sentiment would be an idiosyncratic factor affecting demand for closed-end funds only and would not be priced in equilibrium. Lee et al. showed that changes in discounts were correlated with returns on smaller stocks, which happen to be a class of securities held largely by individuals. This suggests that, since World War II, fluctuations in closed-end fund discounts—and the existence of the average discount—may have been driven by the same individual investor sentiment factor that has affected the post–World War II pricing of smaller stocks.

The consistency of the post–World War II period data with the theory suggests that the average discount on closed-end funds can be a useful measure of investor sentiment. We therefore use this measure to assess the role of investor sentiment as opposed to fundamental news in the boom of 1929.

III. EVIDENCE

Sources of Data on Closed-end Fund Discounts

In the post–World War II period, data on the net asset values of closed-end fund shares—and thus on the premia or discounts of fund shares relative to net asset values—were printed weekly in the financial

press. However, until the middle of 1930 there was no systematic reporting of the net asset values of closed-end funds. During the 1920s, closed-end fund promoters argued that a closed-end fund had tangible assets—its portfolio—and intangible assets—the skills of its professional management. If a fund revealed its portfolio, they argued, its managers would be unable to earn a fair return on their expertise: investors would simply trade to copy the fund's portfolio and avoid paying the management fee. Because these closed-end fund promoters looked on a fund's portfolio as a trade secret, portfolios were rarely published and net asset values rarely calculated.[15]

After October 1929 closed-end funds hastened to publish their portfolios as soon as fund share prices fell below net asset values, to convince investors that the fund was still solvent after the crash. Data on closed-end fund discounts from the fourth quarter of 1929 on are, therefore, often available. We relied on *Barron's*, the *Commercial and Financial Chronicle*, *Commerce and Finance*, and *Keane's Investment Trust Monthly Magazine* for calculated discounts and premia on closed-end funds after the end of 1929.

In the third quarter of 1929, three types of events seemed to trigger a closed-end fund's publication of its portfolio or the current net asset value of its shares. The first was listing on the New York Stock Exchange. From the summer of 1929 on, the Exchange was willing to add closed-end funds to its listings or continue to list funds only if they made their portfolios public.[16] We have taken our sample of funds revealing their net asset values because of NYSE listings from the *Commercial and Financial Chronicle*; contemporaneous security price observations came from the *New York Times*.

The second type of event was the starting up of a new closed-end fund. Its net asset value was simply the initial capital stock subscribed, because the firm had had no chance to make trading or investment profits; the discount or premium could then be inferred from the share price. Lee et al. demonstrated that premia on newly issued funds are substantially correlated with premia on seasoned funds after 1960. Our sample of new funds and their prices is from the *Commercial and Financial Chronicle*.

The third type of event was a closed-end fund's shares going to a discount from net asset value. This often triggered publication of the fund's portfolio in order to convince investors that the fund was underpriced and to try to boost the stock price. When other closed-end funds' managements had positive values on the stock market, it seemed unreasonable to fund managers that their funds should sell at a discount. We believe, therefore, that funds that published their portfolios before

[15] See Becker, "The Investment Company."

[16] New York Stock Exchange, "Tentative Special Requirements," pp. 5–6.

October 1929 did not reflect the average premium or discount; such funds were drawn from the lower tail of the distribution. We have one such fund in our sample. The American European Securities Fund published its portfolio in December 1928 and December 1929. We traced the net asset value of the December 1928 portfolio forward and that of the December 1929 portfolio back. The two portfolios had similar net asset values, and we used a weighted average to construct monthly estimated premia and discounts for American European Securities during 1929.

We also found retrospective data from various sources on closed-end fund discounts and premia before 1929. Post-1929 publication of net asset value data was sometimes combined with publication of pre-1929 net asset value data as well; those observations are also included in our data base.

The Evolution of Discounts: Quantitative Evidence

Figure 3 presents our observations on discounts and premia on closed-end funds. Funds selling for premia of more than 175 percent above net asset value are omitted. There are 13 such in our sample—6 of them during 1929 and 7 during 1932 and 1933. These premia occurred because highly leveraged funds with large debt liabilities found the value of their portfolios shrinking to the face value of their debt obligations. In such a case, high premia almost always exist. Even though the common stock had an immediate liquidation and net asset value close to zero, the stock had nowhere to go but up: if the fund's portfolio declined further the bondholders swallowed the loss, but if the portfolio rose the stockholders kept the gain. This consideration led the common stock to sell at a large relative premium with respect to net asset value when the net asset value was close to zero, and led the common stock to continue to have value even when the fund's portfolio was worth less than the fund's outstanding debts. We omit such observations with very high relative premia from our sample.

Similarly, we omit 26 observations of funds with common stock that had negative net asset values during 1932 and 1933. The Appendix Table presents the funds, asset values, premia or discounts, and sources for our observations before the beginning of 1930, after which the number of data points becomes much larger.

The first panel of Figure 3 presents the premia on seasoned funds for which we could obtain data, excluding American European Securities, which is treated in the second panel. We use the median premium to measure the central tendency of the premia, because it is insensitive to the very large outlier premia in the upper tail of the distribution. In the first quarter of 1929, the median seasoned fund sold at a premium of 37 percent. In the third quarter of 1929, this premium rose to 47 percent.

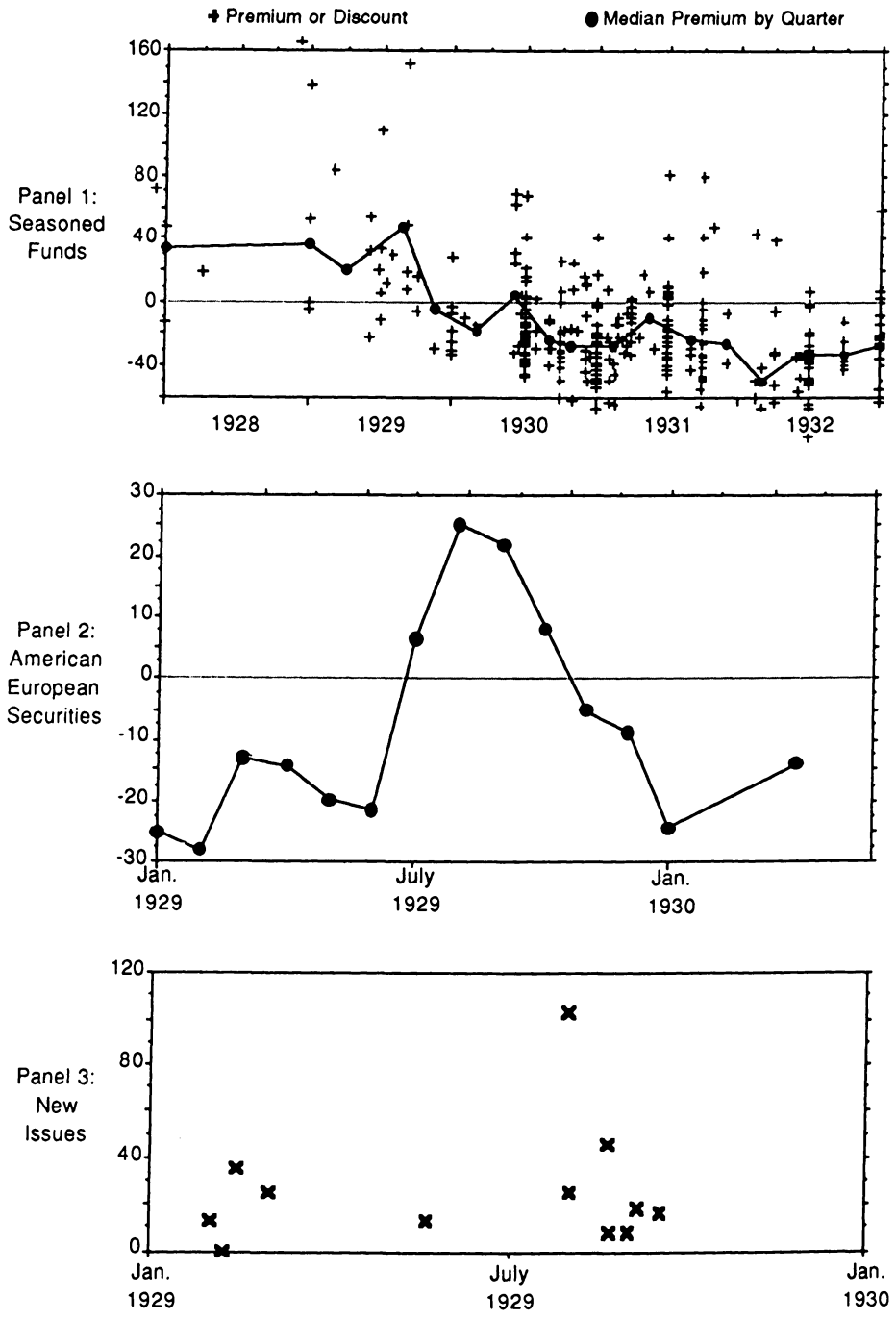

FIGURE 3

PREMIA AND DISCOUNTS ON CLOSED-END FUNDS, IN PERCENTAGE POINTS

Source: See text.

However, by December 1929 a substantial majority of seasoned funds sold at discounts, with the median discount at 8 percent.

Throughout the early 1930s the median seasoned closed-end fund sold at a substantial discount. After 1930, shifts in the average closed-end fund discount were roughly in phase with shifts in the stock market. Periods during the 1930 to 1933 slide in which stock prices declined most steeply tended also to show a widening of closed-end fund discounts; by contrast, periods in which stock prices fell only slowly or held steady tended to show a narrowing of discounts. Although there is considerable cross-sectional variation in discounts, the first panel makes it clear that discounts on different funds moved together—as the theory of investor sentiment predicted and as the post-1960 data showed.

Sluggish Reporting

The evidence on median premia suggests very large premia in the third quarter of 1929, indicating excessive investor optimism. There may be several problems with these data. First, seasoned funds might be entering our sample *because* their premia were unusually large, and for this reason were reported in the sources we use. Second, a pattern similar to our findings could be accounted for by sluggish adjustment of reported net asset values. During a sharp market rise, the measured premium will rise if the reported net asset value does not increase while the price does.

Some additional evidence can be brought to bear on these objections. American European Securities is a fund that is likely to have had smaller premia than the median, because it published its portfolio in 1928 and 1929 at least in part to call attention to its management's view that it was undervalued in the market. The second panel in Figure 3 presents the premia on this fund. At the beginning of 1929, the American European Securities Fund sold at a discount of more than 20 percent, even when there was no evidence that other funds sold at discounts. By the third quarter of 1929, American European Securities sold at a premium of 20 percent; although this is not as high as the median premium, it is large both by the standards of American European Securities' previous price relative to net asset value and by the standard of post–World War II experience. This premium had become a discount once again by the end of 1929. The fact that a fund with small premia relative to those of other funds nevertheless sold at a premium of 20 percent in the third quarter of 1929 is strong evidence that large premia were the rule, not the exception.

Our interpretation of procyclical closed-end fund premia is that investors overreact to good news; therefore, periods of high fundamentals are also periods of *excessive* optimism. This optimism is reflected, in particular, in high premia on closed-end funds. In principle this empirical finding could also result from sluggish adjustment of printed

net asset values to the true current market prices. If net asset values fail to move when the market moves, premia will widen precisely when the market rises, producing our finding.

With respect to this sluggish reporting objection, four points should be noted. First, Lee et al. failed to find evidence of sluggish adjustment of net asset values in post-1960 data. Second, the calculated premia and discounts on American European Securities are made from their reported holdings on specific dates and thus are not sluggish. Third, for the premia we observe to be spurious, net asset values must fail to adjust at all in spite of large market movements—they must be not just sluggish but stale.

Fourth and most important, the third panel of Figure 3 shows evidence of large premia on newly issued closed-end funds at the time their trading prices were first quoted. The first quote usually occurs within a day or two of issue. In the summer of 1929 the median newly issued fund sold at a premium of 25 percent. In the winter of 1929–1930 no new fund issues are to be found. Evidence on newly issued funds should be viewed in conjunction with the other evidence, as by itself it might be misleading. Newly issued funds might have been dressed up for new investors, and so their premia might have overstated the typical premium. Alternatively, new funds might have been quoted at prices available to "insiders" only, so their premia might have understated the typical premium.

Taken together, the evidence on seasoned funds, American European Securities, and newly issued funds all point to large premia in the third quarter of 1929. We interpret these premia as evidence of excessive investor optimism. The change from a 47 percent premium in the summer of 1929 to a 25 percent discount in the summer of 1920 imposed a negative 72 percent return to holders of seasoned closed-end funds for the year, over and above the 12 percent or so in real negative return from July 1929 to July 1930 experienced by the fund fundamental values because of the stock market crash. The relative fall in the value of closed-end funds in 1929–1930 was thus much larger than the relative fall in the value of stocks of operating companies.

The Evolution of Discounts: Qualitative Evidence

The quantitative evidence on discounts before the crash of 1929 is backed up by less formal, qualitative evidence as well. The most significant further evidence that premia must have been large in the third quarter of 1929 is the massive issue of new funds during that period, which we are about to document. But there is other evidence as well. The *Magazine of Wall Street*, for example, recommended the following guidelines for selecting closed-end funds on September 21, 1929.

> Shares of an investment company capitalized with common stock only and earning 10 percent net on invested capital might be fairly priced at 40 percent to 50 percent in excess of share liquidating value. If the past record of management indicates that it can average 20 percent or more on its funds, a price of 150 percent to 200 percent above liquidating value might be reasonable. . . . To evaluate an investment trust common stock, preceded by bonds or preferred stock, a simple rule is to add 30 percent to 100 percent, or more, depending upon one's estimate of the management's worth, to the liquidating value of the investment company's total assets.

This recommendation, made only a month before the Great Crash, assumes as a matter of course that funds should be selling at large premia; managers' ability to pick stocks is thought to multiply the value of the fund by a factor ranging from 3/2 to 3. Moreover, investors are advised to chase the trend, to load up on funds whose assets in the past have shown good performance, on the theory that their managers are the best.

Such a blithe assumption—that the intangible skill of a fund's management should lead investors to value it as worth far more than its net assets—could only be sustained if closed-end funds were typically selling at high premia over net asset values. The paragraph just quoted would seem eccentric in the post–World War II period, when funds have typically sold at discounts. Academics and analysts who have recommended closed-end funds in the post–World War II period have stressed how the existing discount gives purchasers greater fundamental returns for an equal initial investment; they have not stressed the trading skill of the fund's managers or argued that it "ought" to sell for half again its net asset value.[17]

Investment analysts trying to direct investors away from closed-end mutual funds also wrote as if such funds sold at far above net asset value in the third quarter of 1929 and earlier. McNeel's Financial Service in Boston, for example, ran a series of large advertisements in 1929 issues of *Commerce and Finance*, asking (in bold type), "Are You Paying $800 for General Electric When You Buy Investment Trusts?" These advertisements noted that investment trust stocks were "in many instances selling for two or three times . . . asset value. They are issued to the public and almost immediately quoted double or treble the issue price." They asked whether it really made sense for investors to be "paying double or treble the current prices for high grade securities."

At the end of 1929 Charles Keane, who for several years had been compiling information sent to him by individual closed-end funds in his *Keane's Manual of Investment Trusts*, shifted to publishing *Keane's Investment Trust Monthly*. This magazine was written by and for managers in and promoters of mutual funds, predominantly the closed-end funds that then had the largest market share. Precrash editions of

[17] See Malkiel, *Random Walk* (1975 edn.), pp. 260–64.

Keane's Manual of Investment Trusts and precrash "Investment Trust" columns in Wall Street newspapers gave considerable space to funds selling at premia from net asset values. Periodicals might bias their reporting to cover the more spectacular funds selling at unusually high premia, but there is internal evidence in *Keane's Investment Trust Monthly* that the emergence of discounts on the majority of funds after October 1929 was a new development.

The articles in *Keane's Investment Trust Monthly* from early 1930 on show repeated surprise and puzzlement at the fact that closed-end funds were selling at discounts from net asset values. A range of commentators in *Keane's*, just like the ones in the *Magazine of Wall Street*, argued that a closed-end fund had tangible assets—the stocks and bonds in its portfolio—and intangible assets—the skills of its managers at picking stocks. Its tangible assets were worth their current market values; its intangible assets had a value as well. They concluded that closed-end funds should always sell at a premium to their net asset values and left no doubt that they viewed discounts on those funds as a *new* as well as puzzling phenomenon.

Keane himself wrote in his magazine on May 20, 1930 that there were three reasons for a closed-end fund to sell at a discount from its net asset value: management incompetence, management corruption, or a fear that the fund had undertaken unfavorable speculations. At the beginning of 1930 managers and analysts writing for the *Investment Trust Magazine* advanced the hypothesis that discounts on closed-end funds had emerged because investors feared that funds were highly committed and leveraged during the crash, and began to advocate the publication of portfolios—even though this would, they said, allow for free-riding on managerial expertise—to reassure investors. Indeed, funds began to publicize their holdings in mid-1930 with the express intent of reassuring investors that they still had tangible assets after the crash, thereby strengthening demand for their stock.

In sum, the evidence leaves no doubt that closed-end funds sold at very large premia to net asset value in the third quarter of 1929. In the model of De Long et al., this is evidence of fundamentally unjustified noise trader optimism of large magnitude. The implication is that other securities were also selling for more than their fundamental values. Even though the rational estimation of fundamentals was extremely high in the fall of 1929, the pattern of closed-end fund premia suggests that stock market values were even higher than those estimates.

New Issues of Closed-end Funds

Closed-end funds can only be issued at a premium to net asset value. The assets of the fund must be bought with the proceeds of the sale. And there must be enough left over to induce promoters to set up the fund. According to De Long et al.'s theory, closed-end funds will be issued

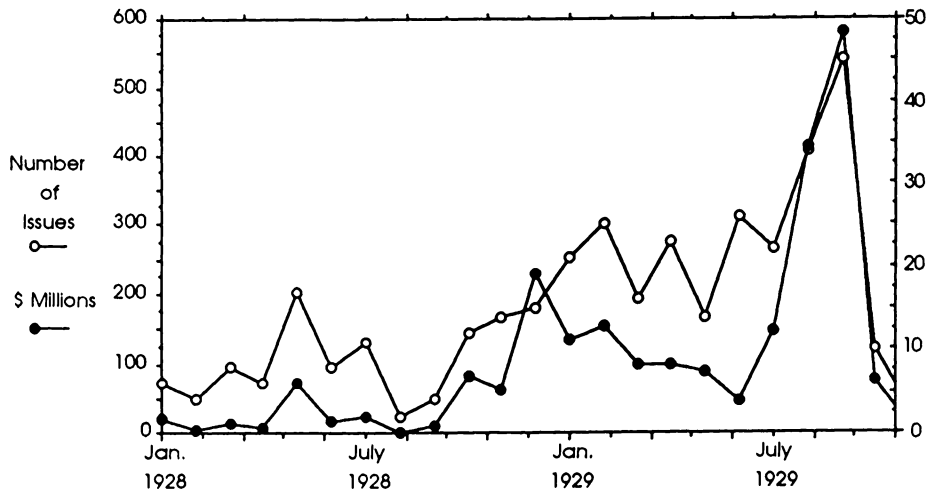

FIGURE 4

THE NUMBER AND VOLUME OF NEW CLOSED-END FUND ISSUES, 1928–1929 (INCLUDING NEW ISSUES BY SEASONED FUNDS)

Source: Compiled from the *Commercial and Financial Chronicle*.

when investors are excessively bullish, as entrepreneurs attempt to profit from this excessive bullishness by repackaging stocks into funds. After the crash, investigators asked Goldman Sachs partner Sydney Weinberg why his company had formed so many closed-end funds so rapidly in 1929. He replied, "Well, the people want them."[18] Lee et al. reported that in the post-1960 period new closed-end fund issues were concentrated in times when seasoned funds were selling at premia. This suggests that the same factor that caused seasoned funds to sell at a premium also created the demand for the new funds. We have established in Figure 3 that both new and seasoned closed-end funds sold at large premia in the summer of 1929. We now consider new fund issues in 1929.

Almost $1 billion of new fund equity (including preferred shares) was issued in the third quarter of 1929, almost $1.9 billion for all of 1929, and $3.4 billion since the funds started being issued in 1923 and 1924. Relative to the size of the U.S. economy then, new closed-end fund issues in the third quarter of 1929 were as large a proportion of the GNP as a sum of $55 billion would be today.

Figure 4 presents the time pattern of the number and dollar volume of new issues by closed-end funds (including expansions of preferred stock by seasoned funds) during 1928 and 1929, which saw the issue of 70 percent of all funds issued in the 1920s. Both series began increasing toward the end of 1928, and reached their maximum in August and

[18] U.S. Congress, Senate, *Hearings on S. 3580*, April 3–26, 1940, p. 230.

September of 1929. After that they fell off: no closed-end funds were started in the 1930s, though a few funds made small issues of preferred stock during the spring 1930 rally. The evidence confirms that new issues reached astronomical proportions at the same time that the premia on closed-end funds reached their peak. This fits the investor sentiment theory, in which closed-end funds are created by rational investors to take advantage of excessive noise trader optimism.

New issues were typically issued to insiders or to favored customers at prices slightly above the net asset value, but many of them quickly rose to a large premium. For example, Lehman Brothers Corporation was significantly oversubscribed at $104 per share that bought $100 in assets (but note that its management contract gave 12.5 percent of profits to Lehman Brothers as a management fee; its true net asset value was perhaps $88). It immediately rose to $126 per share in open trading. The organizers collected not only $4 per share and large future management fees, but they were also significant initial investors at more favorable terms than those available to the public, and they reserved the right—not valuable if the fund is selling at a discount, but valuable if it is selling at a premium—to take their fee in the form of new shares purchased at current net asset value.

If closed-end fund premia indeed reflect excessive investor optimism rather than skill at management, there will be a tendency for funds to pyramid on top of one another. If each fund can be sold for 50 percent more than its own net asset value, promoters can more than double their profits by establishing a fund that owns funds that hold stocks, rather than just establishing funds that hold stocks. Although we have not been able to compile detailed evidence on the layering of closed-end funds, this prediction is confirmed by one of the largest funds: the Goldman Sachs Trading Corporation. This was a closed-end fund organized in December 1928 with a net asset value of around $100 million. In 1929 one of its largest holdings was the Shenandoah Corporation, another closed-end fund organized by Goldman Sachs. Another large holding was in its own stock. Nor is this all. In the same year, Shenandoah organized a new closed-end fund called the Blue Ridge Corporation and became a large investor in its stock. All these funds traded at premia; at the top of the pyramid, the Goldman Sachs Trading Corporation traded at a premium to a premium to a premium to net asset value.

It is hard to justify these pyramided financial structures as anything other than an attempt to part fools from their money by capitalizing on layer upon layer of investor overvaluation. Goldman Sachs's attempts to satisfy its customers' demands for "funds that hold funds" and "funds that hold funds that hold funds" suggested to Galbraith that it was "difficult not to marvel at the imagination which was implicit in this

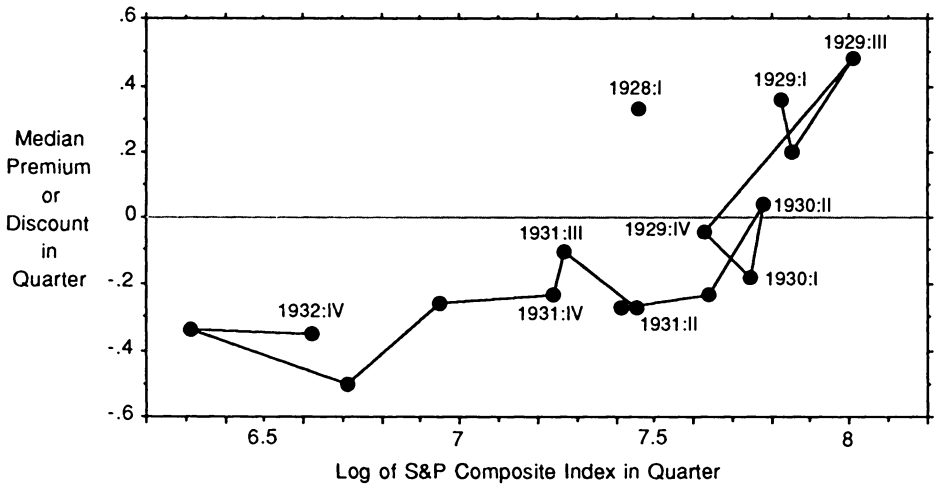

FIGURE 5

THE ASSOCIATION OF THE CLOSED-END FUND DISCOUNT AND THE S & P COMPOSITE INDEX

Source: See text.

gigantic insanity. If there must be madness something may be said for having it on a heroic scale."[19]

IV. THE CLOSED-END FUND DISCOUNT AND THE AGGREGATE MARKET

The Correlation of the Fund Discount and the Aggregate Market

The rise in the median closed-end fund discount from 1928 to 1929, and the fall in the discount after 1929, are correlated with the level of the aggregate stock market. Figure 5 plots movements in the log of the S & P composite index against the median closed-end fund discount. Using quarterly data for the period from the last quarter of 1928 (1928:IV) to the last quarter of 1932 (1932:IV), a regression of the S & P index on the median fund discount produces a slope of 1.4 (with a t-statistic of 4.3 but a Durbin-Watson of 0.9[20]), an R^2 of 0.58, and a standard deviation of the residual of 34.1 percent. A one percentage point rise in the median premium is associated with a 1.4 percent rise in the S & P index. A similar pattern emerges from examining the correlation between the median discount and the price/dividend ratio of the S & P composite.

Regressing the log price/dividend ratio on the median discount over 1929–1932 yields an R^2 of 0.69, a slope coefficient of .77 (with a t-statistic of 5.4), and a standard error of the residual of 15 percent. The

[19] See Galbraith, *Great Crash*, pp. 48–70; the quotation comes from p. 69.

[20] The low Durbin-Watson statistic implies that the t-statistic is not trustworthy. This regression cannot be interpreted as a formal test of a hypothesis, because the data are too few to achieve any statistical precision.

evidence that stock prices move together with closed-end fund premia is therefore not consistent with standard explanations of the closed-end fund puzzle. The evidence supports the view that individual investor sentiment may affect stock prices and not just closed-end fund premia.[21] The question then is, How much of the stock price rise in 1929 could be attributed to overpricing?

If we could assume that fundamentals over this time period were relatively constant or slowly changing, or that fundamental values were proportional to dividends, then we could use the correlation between the median closed-end fund discount and stock prices or price/dividend ratios to judge the extent of overvaluation in the summer of 1929. But this assumption does not appear plausible during the onset of the Great Depression, for there is every reason to believe that fundamentals were volatile around the end of the 1920s. We therefore turn to the Barsky and De Long assessment of how rational estimates of fundamental values shifted and show that the median closed-end fund discount has a very high correlation with those movements in stock prices that are unaccounted for by movements in that estimate of fundamentals.

Barsky and De Long–Based Measures of Investor Sentiment

Barsky and De Long noted that large swings in U.S. real stock prices over the twentieth century followed a relatively simple pattern: decades of rising dividends carried stock prices upward more than proportionately. They argued that such a pattern in large swings could be accounted for if investors expected the future growth rate of dividends to be high when past dividend growth had been high. In Barsky and De Long's framework, investors extrapolate *growth rates* of dividends.[22] Small changes in present dividends can thus have extremely large consequences for the warranted value. This framework's volatility allows it to fit the long swings in the aggregate stock market better than models that assume mean reversion in the level or growth rate of dividends.[23] An alternative interpretation is that even though dividend growth rates should not be extrapolated, investors do so and hence overreact to news. Barsky and De Long's warranted value would then attribute a larger share of stock price movements to "fundamentals" than would be appropriate.

Here we concentrate on shifts in the difference between the S & P index and the Barsky–De Long measure of fundamentals. Such shifts

[21] In the post-1960 period, when individual investors became less important in trading larger stocks but were still important in trading small stocks, closed-end fund premia moved together with smaller stocks. See Lee et al., "Investor Sentiment."

[22] The complete argument is given in Barsky and De Long, "Bull and Bear Markets."

[23] For such measures, see Shiller, *Market Volatility*, pp. 105–30 and 153–73. The Barsky–De Long model of "fundamentals" accounts for 70 percent of the twentieth-century variation in the year-to-year January values of the inflation-adjusted S & P composite index; see Barsky and De Long, "Why Have Stock Prices Fluctuated?"

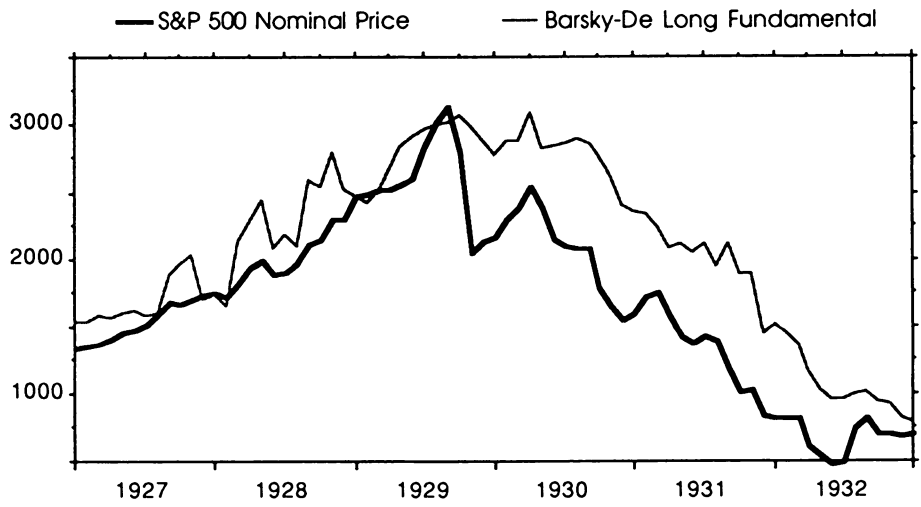

FIGURE 6

THE S & P INDEX AND THE BARSKY–DE LONG FUNDAMENTAL ESTIMATE
(1941–1943 = 100)

Source: See text.

are attributed to fundamentals by none of the models. They are thus most likely to be driven by shifts in investor sentiment as opposed to fundamental values. We examine the correlation of the estimate of investor sentiment constructed from the Barsky–De Long measure of fundamentals with the average premium or discount on closed-end funds.

Figure 6 plots monthly average values of the S & P composite nominal price and the fundamental measure from January 1925 to January 1933.[24] We have calculated monthly values of the fundamental estimate, setting the current dividend equal to a three-month centered moving average of dividends on the S & P composite as reported by Alfred Cowles.[25] Note that the Barsky–De Long fundamental is almost as volatile on a month-to-month and quarter-to-quarter basis as is the S & P composite. At the end of the 1920s and the beginning of the 1930s there were much larger short-run changes in dividends than has been the rule since World War II. Estimated fundamentals rose throughout the bull market of the 1920s as real dividends grew and their rate of growth increased. The nominal value of the Barsky–De Long fundamental reached its peak in 1930. Thereafter deflation lowered the fitted nominal for a constant real fundamental. The fall in real dividends as the economy slid into the Depression reduced the real fundamental value as well.

The difference between the S & P stock index and the Barsky–De

[24] Barsky and De Long in "Why Have Stock Prices Fluctuated?" calculated their fundamental as of January only.

[25] Cowles, *Common Stock Indices*.

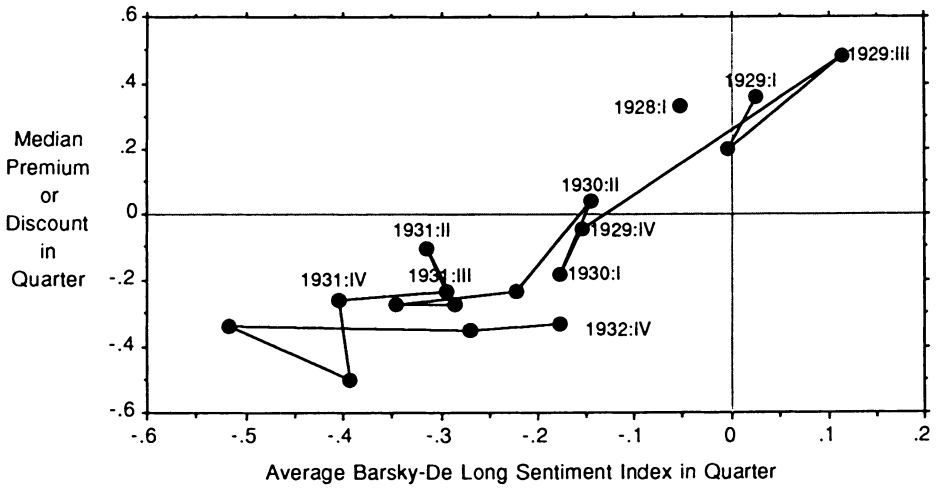

FIGURE 7

THE ASSOCIATION OF THE CLOSED-END FUND DISCOUNT AND THE BARSKY–DE LONG SENTIMENT INDEX

Source: See text.

Long fundamental can be read from the data in Figure 6. We call this difference the "Barsky–De Long sentiment index." Significantly, this index has been constructed independently of and with no reference to the premium on the typical closed-end fund. In 1928 and early 1929 this index was near zero; it then rose during the third quarter of 1929 and crashed with the market afterward. The index remained negative during the early 1930s.

Figure 7 plots the median premium on closed-end funds against the Barsky–De Long sentiment index.[26] There is a high positive correlation between the two. Regressing quarterly median premia on quarterly averages of the sentiment index from 1931:I through 1932:IV produces an R^2 of 0.77, a standard deviation of the residual of 7.6 percent, and a slope coefficient of 0.47 (with a t-statistic of 6.52). Each 1 percent shift in the median closed-end fund premium is associated with a 0.47 percent shift in the S & P composite index relative to the Barsky–De Long fundamental. The fit between their sentiment index and the median closed-end fund discount is much tighter than the fit between the raw S & P and the discount—suggesting that at least some of the large residual variance when stock prices were regressed on the discount sprang from shifts in fundamentals that were not correlated with shifts in sentiment as captured by the median premium.

Using Lee et al.'s estimate of the average closed-end fund discount of

[26] The median premium is calculated quarterly. During 1929 especially we have too few observations to obtain good estimates of typical monthly premia and discounts.

15 percent as the level at which investors are neither excessively optimistic nor excessively pessimistic, we can calibrate the absolute level of the stock market. Our estimates suggest that stock market mispricing in this period was about half the deviation of the closed-end fund premium from minus 15 percent. In July 1929 the typical closed-end fund premium was about 45 percent and thus 60 percent above its average post-1960 level. The S & P index then was approximately 30 percent above the level it would have reached had the closed-end fund discount been at its "normal" level. We therefore attribute approximately 30 percent of the S & P composite's value in the summer of 1929 to overvaluation from excessive investor optimism.

If we assume that Barsky and De Long's estimate ascribed too high a share of stock price movements to shifts in fundamentals, our estimate of the S & P composite's overvaluation in the summer of 1929 is even higher. On the assumption that fundamental values are proportional to dividends, the 0.77 slope coefficient from the regression of the raw price/dividend ratio on the median fund discount suggests an overvaluation of 45 percent in the summer of 1929. On the assumption that fundamental values are approximately stationary from year to year, the 1.4 slope coefficient from the regression of the nominal price on the median discount suggests an overvaluation of 80 percent.

V. SOME POSSIBLE REAL EFFECTS OF STOCK MARKET MISPRICING

The last years of the 1920s were ones of enormous expansion in the quantity of securities issued on the U.S. capital market. In 1928, $3 billion each of stocks and bonds were issued, and in 1929 $6 billion of stocks and $2 billion of bonds were issued. Between 1925 and 1929, gross fixed investment ran at a constant rate of $11 billion (measured in 1929 prices). Stock financing was thus an unusually important source of funds during this period—as one would expect if managers believed their equity to be overpriced. Not all equity issues, however, financed productive investment. Some of them were refinancing issues (involving calling in the bonds and issuing stock in their place); perhaps $2 billion of new issues in 1928 and in 1929 were devoted to that purpose.

More important, in 1929 a large fraction of equity issues was closed-end investment companies. Figure 8 plots the time series of the volume of new issues of all stocks and non-closed-end-fund stocks. The figure shows a peak $800-million issue of new stocks in May 1929, which largely reflected refinancing of bonds by utilities. It also shows that closed-end funds were a significant portion of new financing in late 1928 and early 1929.

Perhaps the most interesting revelation of Figure 8 is that closed-end funds dominated new stock issues in the summer and early fall of 1929,

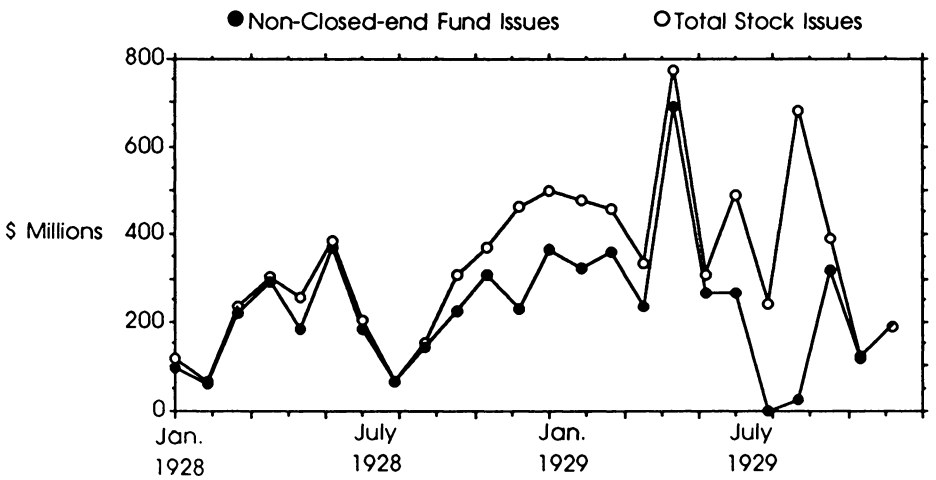

FIGURE 8

POSSIBLE CROWDING OUT OF OPERATING COMPANY EQUITY BY CLOSED-END FUND ISSUES

Source: Compiled from the *Commercial and Financial Chronicle*.

displacing other stocks completely in June and July.[27] At the stock market peak, most equity financing was closed-end fund financing. One interpretation of this finding is that closed-end fund issues crowded out new stock issues in that period. This raises the possibility that the overpricing of closed-end funds in the summer of 1929 reduced corporate access to capital. The normative significance is ambiguous. Reducing corporate access to capital, and therefore possibly investment, might cause good projects not to be undertaken and thus would reduce welfare. But if stock market bubbles led to inefficiently cheap capital and therefore caused fundamentally unproductive investments to be undertaken, displacing such investments would raise welfare.

The Approach of the Great Depression

A strong tradition, led by Friedman and Schwartz, argues that it was not the speculative overvaluation but the government's reaction to it that brought on the Great Depression.[28] Both Hamilton and Miron have recently argued that the Federal Reserve from 1927 to 1929 pursued much more contractionary policies than were reasonable given the state of the real economy.[29] The Federal Reserve believed it should be in the business of restricting the rise in stock prices by imposing high interest

[27] There was a seasonal pattern to new stock issues. On the average, during the 1920s new issues in July through September occurred at half the rate of the other three quarters of the year. In the third quarter of 1929, however, there was a very large volume of new issues, many of which were for closed-end funds.

[28] Friedman and Schwartz, *Monetary History*, chap. 7.

[29] Hamilton, "Monetary Factors," pp. 145–69; Miron, "Monetary Policy."

rates and restricting credit. It feared that if it did not do so, the bubble might be followed by a bust and a recession.

The ensuing high interest rates and credit restriction had an effect: economic activity reached a peak in the summer of 1929 and then started downward. The Federal Reserve Board, fearing that too-easy money might renew a speculative bubble and set the stage for an even worse crash in the future, reined in the Federal Reserve Bank of New York's instinct to reduce interest rates and provide more liquidity in the fall of 1929.[30] Miron argued that the Federal Reserve's fear of a depression brought on by a speculative crash led it to try to moderate stock price rises, but that its attempts to curb the stock market with tight money ironically helped bring on the very depression it had hoped to avoid.

These two possible real effects of stock market mispricing remain speculative, even after 60 years in which analysts have tried to assess their importance. They show the potential for waves of overenthusiasm or overpessimism in the stock market to seriously derange the real economy—in this case, possibly by crowding operating companies out of the capital market, thus slowing down the expansion of successful corporations. Another possible scenario shows the government following policies that damage the real economy while it tries to control the financial economy.

VI. CONCLUSION

In few cases can economists observe fundamental values of securities directly. Closed-end mutual funds are one of them: their fundamental values are simply the net asset values of their portfolios. In this article we have used the difference between prices and values of closed-end funds as a measure of investor sentiment. We then used that measure to assess the extent to which the high level of stock prices in the summer of 1929 and their subsequent crash reflected departures of market prices from "fundamentals."

In the late 1920s, in contrast to previous and subsequent patterns, closed-end funds sold at large premia. We interpret those premia as a sign that investors in closed-end funds were overly optimistic: at the peak, in the summer of 1929, they appeared willing to pay 60 percent more than post–World War II experience would suggest was the "normal" relative price of a closed-end fund. This evidence from closed-end funds suggests that the stock market was substantially overvalued in the summer of 1929. Given the correlations between shifts in the median closed-end fund discount and shifts in average stock prices, our crude estimate is that the S & P composite was at least 30 percent above fundamentals.

[30] The theory of the economy underlying such a belief is analyzed in De Long, " 'Liquidation' Cycles."

APPENDIX TABLE
PRE-1930 OBSERVATIONS OF CLOSED-END FUND PREMIA AND DISCOUNTS

Fund	New Issue?	Date	Premium or Discount (%)	Source
Investors' Equity Co.		1927.91	71	Keane/NYT
General Public Service Corp.		1928	−12.5	CFC
Chain Store Investment Corp.		1928	47.1	Baker Library, Higgins Collection
Continental Securities Corp.		1928.25	19	Keane/NYT
Investors' Equity Co.		1928.91	166	Keane/NYT
American, British, and Continental Corp.		1929	138	Keane/NYT
Chain Store Investment Corp.		1929	52.8	Keane/NYT
General American Investors		1929	233	Keane/NYT
General Public Service Corp.		1929	−4	CFC
Shawmut Association		1929	0	Keane/NYT
Capital Administration Co.		1929	1235	Keane/NYT
AES		1929	−25.246	Authors' calculations
Tri-Continental	New Issue	1929.08	13	CFC/NYT
AES		1929.08	−28.152	Authors' calculations
National Securities Investment Co.	New Issue	1929.1	0	CFC/NYT
Chicago Corp.	New Issue	1929.12	36	CFC/NYT
Standard Investing Corp.		1929.16	84.7	Keane/NYT
Chain and General Equities Corp.		1929.17	25	CFC/NYT
AES		1929.17	−13.016	Authors' calculations
AES		1929.25	−14.154	Authors' calculations
AES		1929.33	−19.754	Authors' calculations
Mayflower Associates	New Issue	1929.39	13	CFC
Investors' Equity Co.		1929.41	54	CFC
AES		1929.41	−22.4	CFC/NYT/Keane
Union-American Investing Co.		1929.41	32.1	CFC
AES		1929.42	−21.527	Authors' calculations
Mayflower Associates		1929.47	20	CFC
Shawmut Association		1929.49	−10.7	CFC
General Public Service Corp.		1929.49	34.1	CFC
United Founders Corp.		1929.49	110	CFC
U.S. and International Securities Corp.		1929.49	212.26	CFC
Power and Light Securities Trust		1929.49	6.1	CFC
AES		1929.5	6.475	Authors' calculations
AES		1929.53	11.9	CFC
Tri-Continental Corp.		1929.58	29.18	CFC
Shenandoah Corp.	New Issue	1929.58	103	CFC/NYT
Interstate Equities	New Issue	1929.58	25	CFC/NYT
AES		1929.58	25.196	Authors' calculations
Blue Ridge Corp.	New Issue	1929.64	46	Keane/NYT
Investors' Equity Co.		1929.64	276.6	CFC
American Equities	New Issue	1929.64	8	Keane/NYT
Prudential Investors		1929.66	18	CFC
Standard Investing Corp.		1929.66	48.4	CFC
Second National Investors		1929.66	151.99	CFC
Shawmut Bank Investment Trust		1929.66	8	CFC
American Equities Corp.	New Issue	1929.67	8	CFC/NYT
AES		1929.67	21.729	Authors' calculations
Prince and Whitely	New Issue	1929.68	18	CFC/NYT

APPENDIX TABLE—continued

Fund	New Issue?	Date	Premium or Discount (%)	Source
Lehman Corp.	New Issue	1929.71	16.5	CFC/NYT
Capital Administration Co.		1929.75	263	CFC
Century Shares Trust		1929.75	−5.3	CFC
General Public Service Corp.		1929.75	15.87	CFC/Keane
AES		1929.75	8.062	Authors' calculations
AES		1929.83	−4.925	Authors' calculations
Graymur Corp.		1929.87	−28	CFC
AES		1929.92	−8.737	Authors' calculations
General Public Service Corp.		1930	28	CFC/Keane
Shawmut Association		1930	−33	CFC
Lehman Corp.		1930	−18	Keane/NYT
Blue Ridge Corp.		1930	−24.5	Keane/NYT
Prudential Investors		1930	−30	CFC
Goldman-Sachs Trading Corp.		1930	−6.3	Keane/NYT
AES		1930	−18	Authors' calculations
Power and Light Securities Trust		1930.08	−10	CFC
Lehman Corp.		1930.16	−14	Keane/NYT
AES		1930.25	−13.8	Keane/NYT

Notes: In the Date column, 1929.00 means Jan. 1, 1929; 1929.50 means July 1, 1929; and so on; AES = the American European Securities Corporation; CFC = the *Commercial and Financial Chronicle*; NYT = the *New York Times*; Keane = *Keane's Manual of Investment Trusts*.

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