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The Stock Market of 1929 Revisited: A Note

Applying a formulation devised by Burton G. Malkiel to stock prices prior to the market crash of 1929, this study finds that descriptions of the period as a "speculative orgy" are misleading.

Few economists have questioned and none has dented the dogma that the prices of common stocks in the United States in 1929 were the product of a "speculative orgy" in a "time of madness." [1] Shortly after the stock market crash, Irving Fisher did question the speculative madness view, in an article and in a book,[2] but his arguments quickly dropped from sight leaving no mark. Several others have taken positions similar to Fisher's,[3] but also apparently without effect on the general consciousness.[4]

Fisher's position was that the growth of corporate earnings during the 1920s was not a transitory phenomenon but a durable result of economic development, that the continuation of such growth was a reasonable expectation, and that the increased valuation of stocks based on increased expectations of growth represented rational investor behavior. Stock prices would have risen nearly as much, he believed, even if there had been no "overextension of credit" for stock purchases. He judged that "between two-thirds and three-fourths of the rise in the stock market between 1926 and September, 1929, was justified" [5] by prospective earnings and that the crash could be explained by "the unsound financing of sound prospects." [6]

Business History Review, Vol. XLIX, No. 2 (Summer, 1975).

[1] See John Kenneth Galbraith, *The Great Crash: 1929* (Boston, 1961), xx, xxi.

[2] Irving Fisher, "The Stock Market Panic in 1929," *American Statistical Association, Proceedings*, March, 1930, Supplement, N.S. No. 169A, pp. 93–96; *The Stock Market Crash – and After* (New York, 1930).

[3] Robert Sobel, *The Great Bull Market: Wall Street in the 1920's* (New York, 1968); Lester V. Chandler, *America's Greatest Depression, 1929–1941* (New York, 1970).

[4] Leading text books still speak of a "wild 'bull' market" based only on self-induced speculative expectations (Paul A. Samuelson, *Economics*, 9th ed., New York, 1973, p. 74); and of "the speculative boom of 1928–29, when speculative activity reached heights completely out of touch with the actual profit possibilities or the general level of business activity." (George L. Bach, *Economics*, Englewood Cliffs, New Jersey, 1974, p. 125.)

[5] Fisher, "The Stock Market Panic in 1929," 94.

[6] *Ibid.*, 96.

Unfortunately, the Fisher position was not backed up by any rigorous analysis of stock values, which may account for the scant attention paid to it and for the dominance of the "speculative madness" school of thought.

Since Fisher's time, some progress has been made in the theory of stock values as affected by expectations of the growth of earnings. I propose to use this theory to evaluate the behavior of the stock market in 1929, applying the formulation devised by Burton G. Malkiel.[7]

Assume that the earnings per share of a stock are expected to grow at an above normal rate, g, for n years, after which earnings are expected to grow at a normal rate. Assume also a given ratio of dividends to earnings, d, and a rate of return, r, necessary to induce investors to hold the stock. From these data, the appropriate price, P, of the stock (the price at which the stock can be purchased to yield the required rate of return, r) can be calculated. This price, converted to the form of a price-earnings ratio by dividing by the current earnings per share, E, is given by the following equation:

$$\frac{P}{E} = \bar{p}\frac{(1+g)^n}{(1+r)^n} + d\left[\frac{1+g}{r-g} - \frac{(1+g)^{n+1}}{(r-g)(1+r)^n}\right]$$

where $\bar{p}$ is the price-earnings ratio that will be appropriate for the stock in its normal-growth phase.

The calculated price-earnings ratio thus depends on five variables: the expected growth rate during the rapid-growth phase, the expected length of the rapid-growth phase, the required rate of return, the dividend-earnings ratio, and the normal price-earnings ratio. Inasmuch as we cannot assert what would have been "reasonable" figures for all of these variables for any stock in 1929, we cannot calculate exactly the "reasonable" price-earnings ratios. But we can, with the aid of certain calculations, show the expectations implied by the price-earnings ratios that existed in 1929 and consider whether these implied expectations fall within a reasonable range.

The sample of stocks to be examined is the group in the Dow-Jones Industrials average in 1929. This average increased, from its high point in 1924 to its high point in 1929, by 216 per cent. To check whether the Dow-Jones stocks were representative of the peak price-earnings ratios prevailing in 1929, I have calculated comparable ratios for a random sample of thirty stocks traded on the New York Stock Exchange in 1929, omitting those without positive earnings. The price-earnings ratios of this sample range from 6.2

[7] Bunton G. Malkiel, "Equity Yields, Growth, and the Structure of Share Prices," *American Economic Review*, Vol. 53, No. 5 (December, 1963), 1004–1031.

to 40.4, with a mean of 19.6 and a median of 16.3. The price-earnings ratios of this sample are thus substantially lower than the Dow-Jones sample, which ranged from 11.3 to 65.2, with a mean of 24.3 and a median of 20.4; but the average quality of the stocks of the random sample is also lower than the quality of those in the Dow-Jones Industrials. At any rate, the use of the Dow-Jones Industrials does not appear to bias the study in the direction of understating the prevailing price-earnings ratios.

Table I shows the peak price-earnings ratios of twenty-nine stocks. The question to be answered is whether or not these ratios imply such exorbitant expectations about the rate, g, and duration, n, of the growth of earnings as to warrant the orthodox view that the speculation was irrational.

To isolate the implications with respect to g and n, some plausible values for r, d, and $\bar{p}$ will have to be assumed. With respect to r, a rate two or three percentage points over the rate on corporate bonds seems reasonable. Yields on good-to-high quality corporate bonds during 1929 ran 5 per cent to 6 per cent, suggesting an r of between 7 per cent and 9 per cent. Let us say 9 per cent, to be conservative.

The average dividend-earnings ratio of the twenty-nine stocks in Table I was .53 in 1929. For all corporations in 1929, the ratio of dividends to net earnings was .67. An expected d of .5 during the rapid-growth phase does not seem an excessive assumption for the purpose of these calculations.

The normal price-earnings ratio, $\bar{p}$, depends *on* $\bar{r}$, d, and $\bar{g}$ – the rate of return, dividend ratio, and growth rate that will pertain to the normal-growth phase.[8] Let us initially assume that $\bar{r}$ is the same as r, 9 per cent. Then $\bar{p}$ for various combinations of d and g can be calculated:

d \ g	0%	1%	2%	3%	4%	5%
.5	5.6	6.3	7.1	8.3	10.0	12.5
.6	6.7	7.5	8.6	10.0	12.0	15.0
.7	7.8	8.8	10.0	11.7	14.0	17.5
.8	8.9	10.0	11.4	13.3	16.0	20.0
.9	10.0	11.3	12.9	15.0	18.0	22.5
1.0	11.1	12.5	14.3	16.7	20.0	25.0

[8] The rate of return, $\bar{r}$, consists of the dividend yield, $\overline{dE/P}$, and the rate of growth of the price of the stock. With a fixed P/E, the growth rate of P will equal $\bar{g}$, the growth rate of E. $\bar{r} = \frac{\overline{dE}}{P} + \bar{g}$; therefore, $\frac{P}{E} = \bar{p} = \frac{d}{\bar{r} - \bar{g}}$. (What if $\bar{d} = 0$? $\bar{d}$ refers to a steady-state dividend ratio – one that will continue permanently. A stock that will never pay a dividend will presumably have a zero price, no matter what the growth of earnings.)

TABLE I

DOW-JONES INDUSTRIALS *
PRICE-EARNINGS RATIOS AND GROWTH RATES OF EARNINGS

Corporation	*Price/Earnings*	*Annual Percent Change, Earnings Per Share*	
	*1929***	*1924–1929*	*1925–1929*
Allied Chemical	28.2	11.7	9.0
American Can	23.0	9.8	−0.4
American Smelting & Refining	13.0	19.0	9.4
American Sugar	11.3	−8.0	18.0
American Tobacco "B"	20.4	5.1	3.4
Atlantic Refining	12.1	30.4	16.5
Bethlehem Steel	12.8	41.2	15.8
Chrysler	27.3	40.1	−2.4
General Electric	44.9	11.2	11.8
General Motors	16.9	29.9	7.9
General Railway Signal	15.3	20.1	12.0
Goodrich	21.7	−9.0	−20.7
International Harvester	17.4	17.3	13.9
International Nickel of Canada	49.2	49.4	18.4
Mack Truck	12.6	−4.7	−6.4
Nash Motors	18.0	17.1	3.4
National Cash Register "A"	21.2	2.3	−1.2
North American Corp.	65.2	8.8	8.9
Paramount-Famous	13.1	−2.5	4.9
Postum (General Foods)	22.2	9.3	5.0
Radio Corp. of America	60.0	22.1	16.2
Sears, Roebuck	27.3	13.8	8.9
Standard Oil, N.J.	17.4	7.6	0.0
Texas Corp.	14.1	4.0	−3.4
Texas Gulf Sulphur	13.3	27.6	23.4
Union Carbide	35.5	13.5	9.4
U.S. Steel	13.1	12.5	10.5
Westinghouse Electric	28.8	8.4	9.6
Woolworth	28.3	2.8	−0.5
Mean	24.3	14.1	8.0
Median	20.4	11.7	8.9

* Curtiss-Wright, which had an earnings deficit in 1929, has been omitted, as its price-earnings ratio cannot be calculated.

** Ratio of the highest price in 1929 to earnings per share in 1929.

The lower and higher of these values of $\bar{p}$ can be eliminated since it is improbable that a firm would normally reinvest a very high proportion of earnings with little or no expected growth, or would reinvest a very low proportion with significant prospects of growth. The relevant values of $\bar{p}$, therefore, lie in a band running diagonally from the lower left to the upper right of the table, i.e., values between 10 and 15.

The narrowing of the plausible range of $\bar{p}$ can be supported by another approach. In the normal-growth phase, the rate of return on equity is likely to tend toward some competitive equilibrium, which the firm will attempt to maintain by its reinvestment policy. To maintain that equilibrium of earnings/equity, earnings and equity would have to grow at the same rate. Assuming such a policy, we can make a calculation of plausible values of $\bar{p}$.[9] With an $\bar{r}$ of 9 per cent, and earnings/equity ratios of 10 per cent to 12 per cent (the predominant range over the long run in manufacturing), the calculated values of $\bar{p}$ for $\bar{d}$ from .5 to 1, run from 11.1 to 16.7.

An argument can be made for somewhat higher values of $\bar{p}$ than those obtained by the above calculations. If 9 per cent is a reasonable assumption for r, then $\bar{r}$ might well be assumed to be lower. Greater risk is attached to stocks during their rapid-growth phase than during their normal-growth phase, because of the greater uncertainty about rapid growth. Consequently, in the normal-growth phase, a lower acceptable rate of return might be assumed. If $\bar{r}$ is set at 8 per cent, then the $\bar{p}$ implied by a constant earnings/equity ratio runs from 12.5 to 25.

Nevertheless, despite the possibility of justifying those higher estimates of $\bar{p}$, it seems preferable to provide a relatively strict test of speculative behavior by choosing moderate values for $\bar{p}$. I shall, therefore, in the calculations that follow, use values of 12 and 15 for $\bar{p}$ as the lower and upper levels of reasonable estimates.

In order to evaluate the price-earnings ratios of the individual stocks, it would be necessary to estimate g and n for each stock. But it is futile to conjecture now about what expectations of growth for each corporation would have been reasonable in 1929. The only feasible approach is to attempt some overall judgments on the stocks as a group.

[9] The increments to equity will be $(1-\bar{d})E$, assuming equity increases only by reinvestment of earnings, and the rate of growth of equity, Q, will be $(1-\bar{d})E/Q$.
By the assumption that E and Q grow at the same rate, $(1-\bar{d})E/Q = \bar{g}$.
From footnote 8, $\bar{p} = \bar{d}/(\bar{r}-\bar{g})$. Substituting for $\bar{g}$, $\bar{p} = \frac{\bar{d}}{\bar{r} - (1-\bar{d})E/Q}$. When assumed values for $\bar{r}$ and E/Q are inserted, $\bar{p}$ can be calculated for every $\bar{d}$.

Table I shows the price-earnings ratios of twenty-nine stocks, and the growth rates of earnings for these companies, for the two periods 1924-1929 and 1925-1929. Since 1924 was a year of mild recession and earnings were below "normal," the use of the 1924 base exaggerates the growth rate. But whichever period is used, one conclusion from these figures seems clear: The growth expectations underlying the price-earnings ratios of the individual stocks were not simple projections of each company's own record in the previous four or five years. The coefficient of rank correlation between price-earnings ratios and previous growth rates is close to zero (.06 for 1924–1929 growth rates, and −.07 for 1925–1929 growth rates). The high average growth rates may have influenced expectations, but individual company experience evidently did not.

Rather than examine individual stocks, therefore, let us consider the answer to some general questions.

1. What g and n would have justified the median price-earnings ratio of 20.4 in Table I?

With $\bar{p} = 12$, the following annual growth rates would have been required:

17% for 5 years
14% for 7 years
11% for 10 years

With $\bar{p} = 15$, the following growth rates would have been required:

12% for 5 years
11% for 7 years
9% for 10 years

Obviously, the justification of a price-earnings ratio of 20.4 requires extremely optimistic growth expectations. If the median growth rate of 1925–1929, 8.9 per cent, is taken as a reference point, only a ten-year duration of that rate, with $\bar{p} = 15$, would have warranted such a price-earnings ratio.

2. What g and n would have been required to justify the actual median price-earnings ratio at the peak of the market?

The procedure of taking the highest price reached by each stock during the year, as in Table I, naturally gives an exaggerated impression of the height reached by the group at any point of time. If, instead, we take the closing prices as of September 2, 1929, approximately the peak of the market, we find for these twenty-nine stocks a median P/E of 15.1 and a mean P/E of 21.6.

TABLE II

DISTRIBUTIONS OF PRICE-EARNINGS RATIOS

P/E	Actual Distribution	Calculated Distribution $\bar{p} = 12$	Calculated Distribution $\bar{p} = 15$
<10	0	8	2
10 to <12	1	4	3
12 to <15	8	7	4
15 to <20	5	7	11
20 to <25	5	2	5
25 to <30	5	1	3
30+	5	0	1
mean P/E	24.3	14.0	18.0
median P/E	20.4	14.5	18.4

To justify the median P/E of 15, the following growth rates would have been required:

With $\bar{p} = 12$, the required growth rates are:

10% for 5 years
9% for 7 years
8% for 10 years

With $\bar{p} = 15$, the required growth rate is 6 per cent for 5, 7, or 10 years.

The actual median P/E could have been justified by growth rates not very different from the median growth rate of 1925–1929, on the assumption of $\bar{p} = 12$, while with $\bar{p} = 15$, a comparatively moderate growth rate would have been sufficient.

3. If the median growth rate of 8.9 per cent had been expected to continue for five years, and the expected distribution of growth rates about the median had been the same as in 1925–1929, what distribution of price-earnings ratios would have been justified?

Table II compares the actual distribution from Table I with the calculated distributions, based on $\bar{p} = 12$ and $\bar{p} = 15$.

The means and medians indicate that the peak prices of the stocks were considerably in excess of what could be justified by a growth rate of 8.9 per cent for so short a period as five years. The distributions, on the other hand, show that both the actual and calculated distributions are bunched in the 12 to 20 range. At the low end of the distribution, the difference between actual and calculated can be attributed mainly to the seven negative growth rates (1925–1929) in Table I. It is improbable that, in a period of generally strong growth, investors would expect persistently de-

clining earnings among a group of high-grade stocks. The differences at the upper end of the distribution are more pertinent to the question of speculative behavior. A few extreme cases account for the chief differences at the upper end between the actual distribution and the calculated distributions. If the calculated distributions are roughly realistic, they suggest that conspicuously unsound speculation was not general, but was concentrated in a small proportion of stocks.

4. Was there any ground for expecting high growth of earnings to continue for five years or more?

The optimism in 1929 of many commentators on business prospects, the idea that the economy had entered a "new era" of development, is usually attributed to the experience of eight years of expansion uninterrupted by any serious cyclical disturbance. But this period of comparative stability, free of monetary disruptions, may have permitted only a belated recognition of a more fundamental change that had occurred in the economy. Modern statistical analysis lends support to the notion of a new phase of technological progress that was sensed in the 1920s.

A recent examination of U.S. growth data since 1800 finds a major change in the nature of the growth process, beginning early in the twentieth century.[10] The data from 1800 to 1905 associate growth primarily with the growth of labor and capital inputs, with only a minor contribution from the improvement of total factor productivity (the residual growth after deducting the contributions of additional labor and capital). The data from 1905 to 1927 and from 1927 to 1967 show a sharp drop in the rate of growth of capital and a sharp jump in the rate of increase of total factor productivity. These new trends can be explained by some combination of technological improvement tending to increase the rise of the productivity of capital together with a higher rate of investment in "unconventional capital" (knowledge and human skills). Whatever the explanation for the new trends, their outcome would be acceleration in the rate of growth of corporate earnings. It thus appears that the expectations of faster growth of earnings in a 'new era' differing radically from the long upward swing of progress that has characterized the industrial revolution,"[11] had a real basis — a major shift in the underlying components of the growth process.

[10] Moses Abramovitz and Paul A. David, "Reinterpreting Economic Growth: Parables and Realities," *American Economic Review*, LXII, No. 2 (May, 1973), 428–439.

[11] Fisher, *The Stock Market Crash and After*, 100. Fisher described the claim of a "new era" as "exaggerated," but he believed that the "tempo" of invention, scientific research, and business activity had increased.

From these questions and answers, some broad conclusions can be drawn about the rationality or irrationality of the stock-market speculation in 1929.

1. While there were good grounds for expecting that the comparatively high growth rates of earnings experienced in the 1920s would continue for some limited number of years, these expectations could not reasonably have justified the peak price-earnings ratios of the Dow-Jones Industrials, taken as a group. The median growth rate of the previous four years could have justified (if one accepts the assumptions of the calculations), a median price-earnings ratio of between 14.5 and 18.4, while the actual median of the peak price-earnings ratios was 20.4.

2. On the other hand, an examination of the peak of the market, rather than the individual peaks, indicates that the median price-earnings ratio at the market peak could have been justified by earnings expectations that were not patently unreasonable.

3. The distribution of the peak price-earnings ratios, when compared to distributions calculated on the assumption of a short rapid-growth phase, suggest that the marked over-valuation of stocks was not general, but was concentrated in a fraction – in the neighborhood of one-fifth – of the stocks in the sample.

Before passing final judgment on the rationality of the stock-investors of 1929, we should observe that the test of stock values applied here is somewhat conservative. The formula used for calculating appropriate price-earnings ratios posits that a growth stock will, at the end of its brief rapid-growth phase, abruptly shift into low gear and grow at a modest "normal" rate. Experience suggests that, for many industries, a gradually declining growth rate after a period of rapid growth is probable. A formula incorporating such an assumption would yield higher estimates of appropriate price-earnings ratios than those calculated above.

Nevertheless, even by the stiff standards of my calculations, the price-earnings ratios in Table I hardly present a picture of a "speculative orgy" in "a time of madness." At least half the twenty-nine participants appear to have been cold sober. Some showed signs of over-indulgence. But, by the usual standards for such things, the conclusion would have to be: not much of an orgy.