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The Stock Market Crash of 1929: Irving Fisher Was Right!

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ABSTRACT

In the fall of 1929, the market value of all shares listed on the New York Stock Exchange fell by 30 percent. Many analysts then and now take the view that stocks were then overvalued and the stock market was in need of a correction. But Irving Fisher argued at the time that instead, the fundamentals were strong and the stock market was undervalued. In this paper, we estimate the fundamental value of corporate equity in 1929 using data on stocks of productive capital and tax rates as in McGrattan and Prescott (2000, 2001) and compare it to actual stock valuations. We find that the stock market did not crash in 1929 because the market was overvalued. In fact, the evidence strongly suggests that stocks were undervalued, even at their 1929 peak.

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1. Introduction

On October 22, 1929, a headline in the *New York Times* read: "Fisher says prices of stocks are low." Two days later, the stock market crashed. Fisher based his projection on strong earnings reports, fewer industrial disputes, and evidence of high investment in R&D and other intangible capital. But, because the market fell dramatically, many analysts concluded that stocks in October 1929 were overvalued.

There have been many attempts by economists since to determine if the rise in stock prices prior to the crash in 1929 was in fact an inflated speculation, a "bubble." They have applied the same basic methodology, namely, to estimate deviations between market values and the present value of expected future dividends. Many find a bubble. Many do not. The results are inconclusive because it is hard to estimate market participants' expectations and the rates at which they discount the future.[1]

In this paper, we take a different approach to the question of whether or not stocks were overvalued. Instead of using data on dividends, we use data on productive capital stocks and tax rates to estimate the *fundamental value* of all U.S. corporations. By this, we mean the value of productive assets in the corporate sector. Our conservative estimate of the fundamental value of these corporations before the crash – assuming as low a value for intangible capital as observations allow – is 20 times after-tax corporate earnings, which for 1929 is 1.8 times GNP.[2]

Estimates of the actual 1929 market value, which are based on samples of publicly traded stocks, are all below 19 times after-tax corporate earnings at the peak in 1929. Thus, we find that the evidence supports Fisher's view that stock prices in the fall of 1929 were low relative to fundamental values.

Our finding is not inconsistent with the fact that the stock market crashed in 1929.

The historical evidence suggests that the stock market crashed because the Federal Reserve severely tightened credit to stock investors, not because stocks were overvalued. Subsequent easing of credit was coincident with a recovery in stock prices.

2. The Market Value of U.S. Corporations in 1929

We first estimate the *market value* of U.S. corporations at the end of August in 1929. By this, we mean the market capitalization. Data are available for representative subsets of U.S. corporations. In this section, we use these data to produce a range of estimates for the market value of all U.S. corporations.

In our view, the most reliable estimate available is a total value of U.S. corporations of 1.54 times GNP, or 17.5 times after-tax corporate earnings. This estimate is based on a detailed study of 135 industrial corporations done by Laurence Sloan and Associates (1936) at the Standard Statistics Company, a company that later merged with Poor's Publishing to become Standard and Poor's (S&P). The estimate we will use, however, is a total value of 1.67 times GNP (or 19 times after-tax corporate earnings). This estimate is based on the price-earnings ratio of the S&P composite stock index. Because we are evaluating Fisher's claim that the stock market prior to the crash of 1929 was undervalued, we want to use a conservative (high) estimate of the actual market value of U.S. corporations in 1929.

During the Depression, Sloan (1936) conducted a study of 135 leading industrial corporations. The companies in the study had fully documented financial histories over the 1922–1933 period and, in the authors' opinion, were representative of large companies in business during this period. The study provides detailed income accounts and balance sheets for the aggregate and specific details for major industries and major corporations.

At the peak of the stock market in late August/early September of 1929, the common stocks of the companies in Sloan's (1936) sample had a market value of $30.8 billion. For the

year 1929, the after-tax net profits available for the common stock were $1.76 billion.

If the companies in the Sloan (1936) study are truly representative of the U.S. economy, then we can use the market value and after-tax profits for these companies to get an estimate of the total value of all corporations. In particular, if we assume that the ratio of market value to after-tax profits (the "price-earnings ratio") for the 135 companies is equal to the price-earnings ratio for all companies, then an estimate for the market value of all companies is the price-earnings ratio of the 135 companies multiplied by after-tax profits for all companies.

In Figure 1, we plot the ratio of economy-wide after-tax corporate profits to GNP. These data are available in the *Survey of Current Business* National Income and Product Accounts (NIPA) for 1929 and after (U.S. Commerce 1929–2000). Prior to 1929, we apply the methodology of the Bureau of Economic Analysis (BEA) to construct our own measures of after-tax corporate profits. (See U.S. Commerce 1985 and our Table A1 in the Data Appendix for details.) In 1929, the BEA reports after-tax profits equal to 8.8 percent of GNP. Using their methodology, we estimate that while 1929 profits were high, this year was not an outlier. After-tax profits in all years from 1925 through 1929 were high by postwar standards.

If we multiply the price-earnings estimate of Sloan (1936), which is equal to 17.5, by 1929 total NIPA earnings, we get an estimate for the market value of all corporations in late August/early September of 1929 of 1.54 times GNP ($= 30.8/1.76 \times 8.8$).

We can use the same procedure with companies in the S&P indices. In Table A2 of our Data Appendix, we provide a list of the 50 companies in the S&P industrial index, the 20 companies in the S&P index of railroads and the 20 companies in the S&P index of public utilities. These 90 companies comprise the S&P composite stock index. Along with names, we report on the market capitalization of each company at the end of August 1929 and the net earnings for the year 1929. The market capitalization is computed with data from the Center for Research on Security Prices (CRSP). Net earnings are the after-tax profits for common

stockholders, which is the sum of common stock dividends plus surplus. Earnings data are compiled by Moody's Investor Services (1930) and Poor's Publishing Company (1930).

For the 50 industrial companies in the S&P index, the ratio of the total market capitalization to net earnings is 18.4. Aggregate earnings and this price-earnings ratio imply an estimate for the aggregate market capitalization of 1.62 times GNP. This is slightly higher than Sloan's (1936) estimate, which was based on a broader subset of industrial companies.

To compute an estimate of the total market capitalization using all 90 companies in the S&P composite index, we first construct weights on industrials, railroads, and public utilities using the entire population of companies in the CRSP database for August 1929. We find that the market capitalization of railroads (SIC 4000) in the CRSP population is 12 percent of the total. We find that the market capitalization of public utilities – including electric, gas, and sanitary services (SIC 4900), as well as communications (SIC 4800) and local and interurban passenger transit (SIC 4100) – accounts for 17 percent of the total market capitalization of the CRSP population of companies. The remaining 71 percent is considered to be in industrials. With weights of 45%, 23%, and 32% on industrials, railroads, and utilities, respectively, we can match aggregate market capitalizations with the S&P subsample.

If we weight market capitalizations and net earnings for the three S&P categories and then take the ratio, we have a price-earnings ratio of 19.[3] Aggregate earnings and this price-earnings ratio imply an estimate for the aggregate market capitalization of 1.67 times GNP, which is close to that for industrials only.

We should note that an estimate of 19 for the price-earnings ratio is significantly higher than that reported by Fisher, who cites the Standard Statistics Company as the source for his data. Chart 11 of Fisher (1930) shows monthly price-earnings ratios for 45 industrial companies between 1928 and 1929. If we take a 12-month average ending in August 1929, we find the ratio to be 14.1. Unfortunately, there is some ambiguity as to whether these numbers

are averages of price-earnings ratios or ratios of market capitalization to total earnings.

But there is other evidence on the total market capitalization in 1929 that is consistent with Fisher's estimates. The evidence is available from the major stock exchanges. First, we can use data on the market capitalization of the 846 companies listed on the New York Stock Exchange (NYSE). In Figure 2, we plot monthly levels in billions of dollars over the 1925–1931 period. We also plot the end-of-year market value as a ratio of GNP. In August of 1929, companies listed on the NYSE had a market value of $89.7 billion – close to the value of GNP for the year 1929, which was $104.5 billion.

Over the postwar period, the market value of NYSE companies was roughly 69 percent of the total value of all domestic corporations, which is reported in the *Flow of Funds Accounts for the United States* (Federal Reserve Board 1945–2000). The Federal Reserve's measure includes the total value of equity of all publicly traded and closely held domestic corporations plus the value of their net debt (debt liabilities less debt assets). Prior to 1974, net debt is a small share of the total value. In 1929, net debt is actually slightly negative, according to the aggregate balance sheet figures reported in the *Statistics of Income* (U.S. Treasury 1913–1997); corporations were net creditors.[4]

In Figure 3, we plot the market value of NYSE companies multiplied by 1.45 (or, 1/.69) and the total value of all domestic companies from the *Flow of Funds*. Although the *Flow of Funds* data are available only after 1945, it is clear from the figure that the market value of NYSE companies as a fraction of the total value of all U.S. companies has been remarkably constant. Notice that the time series in Figure 3 are very close for the entire post-World War II period – not only on average but at peaks and troughs too. If we assume that the ratio of NYSE values to the total is roughly 1.45 in the pre-World War II period as well, we can use the NYSE values to get an estimate for the total value of U.S. corporations at the peak in 1929. (See Figure 2.) This yields an estimate of $130 billion (= $89.7 $\times$ 1.45) for August

1929, or 1.24 times 1929 GNP. If we assume that aggregate earnings are 8.8 percent of GNP, this implies a price-earnings ratio of 14.1. This is the same as Fisher's estimate.

Furthermore, Fisher's estimate and the estimate based on NYSE and *Flow of Funds* data are very close to that found by Jovanovic and Rousseau (2001). Jovanovic and Rousseau use data from all of the major and minor exchanges, such as the NYSE, the regional exchanges, and the over-the-counter market. They compute estimates of the market value of all domestic corporations comparable to estimates of the *Flow of Funds* after 1945. (See their appendix for details.) Their data are annual, so we took their end-of-year estimates and inflated them to get an estimate of the market capitalization at the peak in 1929. Doing this, we find a market capitalization equal to 1.25 times GNP, which is almost equal to the estimate of 1.24 found by using a multiple of the NYSE.

In Table 1, we summarize the findings of this section. In each row of the table, we list the source and coverage of the data, the information available – either the market values or the price-earnings ratios – and our estimate of the total market value of all U.S. companies relative to GNP. As we noted earlier, the estimate we believe to be the most reliable is Sloan's (1936), which implies a total market value of 1.54 times GNP. But this estimate lies between the higher estimates based on S&P companies and the lower estimates of Fisher (1930), Jovanovic and Rousseau (2001), and that based on the NYSE and *Flow of Funds* data.

To be conservative in assessing Fisher's thesis, we will use the estimate of 1.67 times GNP (or 19 times earnings) when we compare the actual market capitalization to our estimate of the fundamental value of the corporate sector.

3. The Fundamental Value of U.S. Corporations in 1929

We turn now to our estimation of the *fundamental value* of U.S. corporations. By this, we mean the value of the underlying productive assets – both tangible and intangible – of

the corporate sector. In this section, we construct lower-bound estimates of the fundamental value of U.S. corporations in August of 1929. Each estimate is conditional on a real interest rate. In the subsequent section, we show that for all real interest rates that are not grossly inconsistent with observations, the fundamental value exceeds the market value.

As McGrattan and Prescott (2001) show, in an environment with stable tax policy, the market value of a corporation along a balanced growth path should be equal to

$$V = (1 - \tau_{pers})(K'_T + (1 - \tau_{corp})K'_I) \tag{1}$$

where K'_T is the end-of-period resource cost of tangible capital, K'_I is the end-of-period resource cost of intangible capital, τ_{pers} is the tax rate on personal income including stock dividends, and τ_{corp} is the tax rate on corporate profits.

In the literature concerned with stock market bubbles, the standard formula used for V is the present discounted value of expected future stock dividends rather than (1). In theory, both can be used. The advantage of (1) is that it requires no assumptions about market participants' expectations. Instead, we need measures of marginal tax rates and the resource cost of capital.

A. Marginal Tax Rates

In Table 2, we report marginal tax rates on corporate profits and dividends. The tax rate on profits is the ratio of the NIPA profits tax liability to the before-tax profits from Table A1. The tax rate on dividends is a weighted-average surtax rate on net income computed from data compiled in the *S*tatistics of Income.[5] The weights used in averaging across net income classes are fractions of dividend income for each class. (See the Data Appendix for details.)

Both tax rates shown in Table 2 stay roughly constant over the 1925–1929 period. The

tax rate on corporate profits was on average 14.6 percent, and the tax rate on dividends was roughly 10.3 percent. The fact that they are stable over time is important for our analysis since we are computing steady-state values.

B. Tangible Capital

We now estimate the fundamental value of tangible capital using data from the *Survey of Current Business* (U.S. Commerce 1929–2000) and the *Statistics of Income* (U.S. Treasury 1913–1997).

In Figure 4, we plot the resource cost of end-of-period tangible capital in the corporate sector, namely, K'_T, relative to GNP. These data are constructed by the BEA and reported in the *Survey of Current Business*. We plot the data with and without inventories. Prior to 1947, inventories are not reported by the BEA so we instead use the value of inventories from balance sheets on corporate tax forms. This is available between 1926 and 1977 from the *Statistics of Income*.

Between 1926 and 1929, the resource cost of total measured, tangible capital plus inventories was on average 1.27 times GNP. This ratio changed little until the Great Depression period. By postwar standards, 1.27 times GNP is high. But tax rates on capital were much higher in the postwar period. Using the average tax rates in Table 2, we compute a fundamental value of 1.14 times GNP ($= (1-.103)\times 1.27$) for tangible capital.

We have not included land in our measure of tangible capital because data are not available on land values. For the postwar period, McGrattan and Prescott (2001) estimate land values to be around 3.3 or 3.4 percent of GNP. Because we are computing a conservative (low) estimate for capital values, we will simply ignore land for our calculations here.

We have also left out any corporate foreign capital, which is not included in BEA measures. But this capital is insignificant in 1929.

C. Intangible Capital

An estimate of intangible capital, namely, K_I', is needed to compute our total fundamental value, V, using (1). This is more difficult than computing the cost of tangible capital because intangible investment is not recorded by the BEA. For the purposes of this paper, we want to construct a lower bound on K_I'. If the lower bound for our estimate of the fundamental value is larger than the upper bound of estimates of the actual market value, we will argue that Irving Fisher was right.

A relation between after-tax NIPA profits and the corporate capital stocks that we can use to infer K_I' is

$$\Pi = iK_T + (i - g)(1 - \tau_{corp})K_I \tag{2}$$

where Π is after-tax NIPA profits, i is the real interest rate, and g is the growth rate of real output. (See McGrattan and Prescott 2000, 2001.) Two assumptions are needed to derive (2). First, we assume that the after-tax rate of return for tangible corporate capital is equal to the rate of return for intangible corporate capital and all other types of capital. Otherwise, firms would not be operating in the interest of their owners. Second, we assume that tax policy is unchanging so that steady-state analysis is appropriate.

To see why (2) holds, consider how the BEA computes NIPA corporate profits. Suppose that the true income from capital in the corporate sector is $r_T K_T + r_I K_I$, where r_T and r_I are rental rates for tangible capital and intangible capital, respectively. If we subtract depreciation allowances for tangible capital, property taxes, and any expenses like R&D that are related to intangible investment, we have the BEA measure of before-tax corporate profits. It is this income that is subject to corporate profits tax. Thus, the BEA measure of

after-tax corporate profits is

$$\Pi = (1 - \tau_{corp})[r_T K_T + r_I K_I - \delta_T K_T - \tau_{prop} K_T - X_I] \tag{3}$$

where δ_T is the depreciation rate of tangible capital, τ_{prop} is the property tax rate, and $X_I = K_I' - (1 - \delta_I)K_I$ is intangible investment. McGrattan and Prescott (2001) show that the real return to tangible investment is $(1 - \tau_{corp})(r_T - \delta_T - \tau_{prop})$, while the real return to intangible investment is $r_I - \delta_I$. The return on intangible investment is not affected by the corporate tax rate because intangible investment can be expensed while tangible investment must be capitalized. Equation (2) follows immediately from the fact that both of these returns are equal to i, the real interest rate.

If we divide both sides of (2) by GNP, we have a formula that we can use to estimate intangible capital given observations on after-tax corporate profits (Figure 1), the resource cost of tangible capital (Figure 4), and the corporate tax rate (Table 2). This formula is given by

$$.088 = 1.27\, i + [(1 - .146)K_I/\text{GNP}](i - g) \tag{4}$$

for some fixed ratio K_I/GNP. Suppose, for example, that the growth rate of real GNP is 3.5 percent and the real interest rate is 5.6 percent. Then our estimate of intangible capital for 1929 – given observations on corporate profits, the corporate tax rate, and tangible capital – is 1 times GNP. Similarly, if the real growth rate is 3 percent and the real interest rate is 5.4 percent, then our estimate for intangible capital is 1 times GNP.

We have observations on real GNP growth from Romer (1989). Romer's estimates imply that real GNP grew 3.64 percent per year between 1925 and 1929. Thus, we have $g = 0.0364$.

The more difficult measurement issue is i, the real interest rate. McGrattan and

Prescott (2000, 2001) use data on noncorporate income and noncorporate capital from the *Survey of Current Business* to construct estimates of i during the post-World War II period, assuming that rates of return were not different across the corporate and noncorporate sectors. Unfortunately, we do not have any pre-crash data to perform this estimation.

To see how the real interest rate affects the value of intangible capital and, therefore, the fundamental value of corporate capital, consider Table 3. It shows how the fundamental value of U.S. corporations, V, changes as we change our estimate of the real interest rate. Because we want a conservative estimate for the value V, we consider a range of high real interest rates, namely, 5 to 7 percent, and therefore low values for intangible capital. Real interest rates around 4 percent are consistent with estimates in the postwar period. Rates above 5 percent are high by postwar standards.

The fundamental value is the sum of the value of tangible capital, which is equal to 1.14, and the value of intangible capital, which varies with the real interest rate. For example, a real interest rate of 5 percent implies a ratio of intangible capital to GNP (K_I'/GNP) equal to 2.1 times GNP. This is the resource cost of intangible capital. With a personal tax rate of 10.3 percent and a corporate tax rate of 14.6 percent, the fundamental value of intangible capital is 1.61 times GNP. If we add this to the value of tangible capital (1.14), then the estimate for the total fundamental value of corporate capital is 2.75 times GNP – much higher than the market value of 1.67 times GNP.

As is clear from Table 3, the critical rate of interest is 6 percent. For real rates below 6 percent, the fundamental value of corporate capital is above 1.67 times GNP, and the market is undervalued. At real rates of 6 percent and above, the fundamental value is below the actual market value, and the market is overvalued.

To justify the DeLong and Shleifer (1991) and Rappaport and White (1993) claim that the stock market was significantly overvalued in August 1929 – say, by as much as 30 percent

– we would have to see a real interest rate in excess of 6.5 percent. According to our theory, for this overvaluation to be consistent with the facts on corporate profits, capital stocks, and tax rates, it must be the case that the value of intangible capital was very low by postwar standards, roughly 0.18 times GNP, and that *real* interest rates were very high by postwar standards, in excess of 6.5 percent. This leads us to the evidence on the real rate of interest.

4. The Real Rate of Interest

In this section, we determine an upper bound for the real interest rate using two methods. First, we use market interest rates from the 1925–1929 period to estimate real interest rates in this period of a stable price level. Second, we use microeconomic and macroeconomic observations along with estimates of preference parameters to bound real interest rates. Both methods lead us to the conclusion that the real interest rate in August 1929 was below the critical level of 6 percent. This implies that the fundamental value of U.S. corporations exceeds the value of those corporations' market equity.

A. Market Interest Rates

The relevant market interest rates were not high in 1929. We consider intermediate- and long-term rates the most relevant because they were less affected by Federal Reserve policy and changes in liquidity premia than short-term rates.[6] In Figure 5, we plot intermediate- and long-term bond yields. All are in nominal terms. For real rates we need to correct for expected inflation. According to Romer's (1989) estimates, prices over this period were very stable. The United States was on a gold standard, and, given no trend in the relative price of gold, expectations of inflation should have been very near zero. Romer's implicit GNP price deflator (with 1982=100) was 14.77 in 1925 and 14.60 in 1929. This implies an annual inflation rate slightly below zero at $-.29$ percent. If we use realized inflation as a proxy for expected inflation, we have to adjust the rates in Figure 5 only slightly higher to get real

rates.

Yields on U.S. Treasury securities were in the range of 3 to 4.5 percent and well below the critical value of 6 percent. If we used these yields as estimates for the real rate of interest, we would conclude that the fundamental value of corporate capital is significantly above the actual market value.

Since we are interested in rates in the corporate sector, a more relevant market rate to consider is the corporate bond yield. Average nominal corporate bond yields were roughly constant over the entire 1925–1930 period, at slightly over 5 percent. According to *Banking and Monetary Statistics* (Federal Reserve Board 1943), the basic nominal yields of corporate bonds at a maturity of two years were around 5 percent for 1929. For longer-term maturities, the yields fell off to 4.4 percent. In the very short term they were 5.6 percent.

The corporate bond yields are averaged over high- and low-grade bonds and may include some default risk. Thus, we view this rate as a conservative upper bound on the real interest rate. If we take inflation into account, the average yields were closer to 5.5 and at most 5.75 percent for a very short period.

If we use the maximum corporate yield of 5.75 percent as an upper bound on the real interest rate, we estimate a resource cost of intangible capital equal to 0.83 times GNP. If we account for taxes, this implies a fundamental value of intangible capital equal to 0.64 times GNP. Adding this to the value of tangible capital implies a total value of 1.78 times GNP, which is equal to 20 times corporate earnings.

B. Macro and Micro Evidence

There is strong indirect evidence that supports our view that the real interest rate was below 6 percent in 1929. In this section, we show how estimates of preference parameters – based on both macro and micro evidence – can be used to put a bound on the real interest

rate.

We assume that households maximize discounted expected utility with the per-period utility function given by $U(c,l) = c^{1-\sigma}v(l)/(1-\sigma)$ and the discount factor given by β. Here, we are assuming that c is consumption and l is leisure. We choose these preferences because they are consistent with observations on growth. (See Lucas 1990.)

We first show that high values of σ and β are needed to account for a high real interest rate in 1929. Then, we report on estimates of σ based on both macroeconomic data and microeconomic data – all of which are too low to justify a high real rate of interest.

The preferences we use imply the following relationship between the real interest rate and the real growth rate of per capita income if l is constant, as it nearly was:

$$1 + i = \frac{(1+\gamma)^{\sigma}}{\beta}, \tag{5}$$

where γ is equal to the growth rate of real GNP less the growth rate of the population. This relation is derived by setting the interest rate equal to the intertemporal marginal rate of substitution.

In the postwar period, real interest rates have been around 4 percent with growth in per capita consumption around 2 percent. Pairs of σ and β consistent with these facts must satisfy $1.04 = (1.02)^{\sigma}/\beta$. Rewriting this, we have $\beta = (1.02)^{\sigma}/1.04$.

Now consider the 1925–1929 period. Real GNP growth between 1925 and 1929 averaged 3.64 percent per year, while population growth averaged 1.26 percent. This implies a real interest rate of $(1.0238)^{\sigma}/\beta$ or $(1.0238/1.02)^{\sigma} \times 1.04$, given our expression for β.

If preferences are logarithmic so that $\sigma = 1$, the implied real interest rate in 1929 is 4.4 percent and the implied fundamental value of U.S. corporations is significantly higher than the market value. For estimates of the 1929 real interest rate as high as 6 percent, the point

at which the pre-crash stock market was correctly valued, a risk aversion parameter of $\sigma > 5$ and a discount factor of $\beta > 1.062$ are needed.

Estimates of risk aversion based on aggregate consumption and hours data are closer to 1 than to 5. For example, McGrattan's (1994) estimate for σ is 1.06 (Table 1, p. 587). High values of risk aversion imply too little variation in key aggregate variables. Furthermore, if the utility function is not additively separable in consumption and leisure, high values of risk aversion imply relative variabilities of consumption and hours worked that are inconsistent with aggregate observations.

Estimates of risk aversion based on micro data also fall below 5. Browning, Hansen, and Heckman (1999) report estimates from a variety of studies of food and nondurables consumption that are in the range of 0.64 to 4 (Table 3.1, p. 609). Attanasio and Weber (1995) consider micro data on nondurables consumption and get an estimate of 1.78 (Table 6, p. 1150). Rosenzweig and Wolpin (1993) study consumption in an Indian village and find the estimate of risk aversion to be close to logarithmic at 0.964 (Table 2, p. 235). Hurd (1989) estimates a life cycle model using data on wealth and gets an estimate of 1.12 (p. 801).

A high value for σ also has implications for the difference in behavior of rapidly growing and slower-growing economies. Examples of rapidly growing economies are Japan, Germany, and France in the 1960s or Korea and Taiwan in the 1965–1995 period. Examples of slower-growing economies are the United States and United Kingdom in the post-Korean War period and Japan, Germany, and France after 1975. If σ were large, returns on capital would be very different across these countries and time periods. Returns would be very high in countries experiencing growth miracles, and given that capital shares are roughly equal across countries and time, the capital-output ratio would be very low. But we do not see sufficiently large differences in returns and capital-output ratios for σ to be much above 1.

In summary, we find no evidence of a high value for the real rate of interest – either

from observations on market rates in 1929 or from postwar micro and macro data. And, as a result, we find no evidence of an overvalued stock market in 1929. Our calculations lead us to the opposite view – that it was undervalued. Thus, we agree with Irving Fisher's view that stock prices in October of 1929 were low.

We should note that at each step in our estimation, we tried to err on the conservative side. Our upper bound for the actual market valuation is 19 times corporate earnings, or 1.67 times GNP. Our lower bound for the fundamental valuation is 20 times corporate earnings, or 1.78 times GNP. A fundamental valuation any lower is not justified by observations on profits, capital stocks, tax rates, growth rates, and interest rates.

5. If Not Overvalued, Why the Crash?

We have established that the stock market crash did not occur because stocks were overvalued in the fall of 1929. Why, then, did stock prices fall 30 percent? The evidence suggests that Federal Reserve policy was the impetus for the crash and the subsequent rise in stock prices in the first half of 1930.

During 1928, the Federal Reserve tightened monetary policy because "intense activity of the securities markets and the unprecedented rise of security prices gave unmistakable evidence of an absorption of the country's credit in speculative security operations to an alarming extent" (Federal Reserve Board 1929, pp. 1-2). In the report, the Board notes that the measures taken in 1928 to stem growth in "speculation" by selling open-market investments and by raising discount rates "had not proven adequate" (Federal Reserve Board 1929, p. 2).

In February 1929, a letter was sent by the Board of Governors to regional Federal Reserve banks stating that "a member bank is not within its reasonable claims for rediscount facilities at its Federal Reserve bank when it borrows either for the purpose of making spec-

ulative loans or for the purpose of maintaining speculative loans" (Federal Reserve Board 1929, p. 3). The Fed was concerned that credit would not be available for nonfinancial business needs. Allowing for discriminatory lending was one way to stem "speculative" investing which was not "conducive to the wholesome operation of the banking and credit system of the country" (Federal Reserve Board 1929, p. 3-4).

Immediately following the Fed's actions, brokers' loan rates rose dramatically. In Figure 6, we plot rates for 90-day brokers' time loans along with other key short-term market interest rates. It is clear from the figure that brokers' loan rates were relatively high in 1928 and 1929. This rise in brokers' loan rates and other short-term rates was the direct effect of Federal Reserve policy and does not indicate that the stock market was overvalued or that lenders perceived a bubble in the stock market as Rappaport and White (1993) have argued.[7]

In fact, the evidence suggests that Federal Reserve policy itself was the impetus for the crash. The Federal Reserve had an explicit policy of constraining credit to stock market investors, and when prices started to fall, it did not provide sufficient liquidity to allow banks to extend broker loans. When credit was eventually eased, stock prices began to recover. Figure 6 shows a drop in the discount rate of the New York Federal Reserve Bank and other key short-term rates during and after November 1929. Figure 2 shows a coincident recovery in prices, until mid-1930. The recovery in stock prices is evidence that a Great Depression was not in the forecasts of 1929 and early 1930. Additional evidence that the Depression was not forecasted in 1929 and early 1930 is provided by Dominguez, Fair, and Shapiro (1988) who used historical data to forecast future output. This is also what our fundamental stock valuations indicate.

6. Conclusions

In February 1930, Irving Fisher published *The Stock Market Crash – and After*. In this book, he explained why he believed stock prices in the fall of 1929 were too low. Galbraith (1954, p. 146), like many economic historians after him, viewed the crash as clear evidence that Fisher was wrong. According to Galbraith (1954), Fisher's book attracted little attention because, as he put it, "one trouble with being wrong is that it robs the prophet of his audience when he most needs it to explain why."

This interpretation of events, however, incorrectly presumes that markets can be overvalued but not undervalued. In fact, many who have studied the stock market in the 1920s view the possible scenarios as twofold. The view is either (*i*) asset prices were too high relative to fundamentals or (*ii*) asset prices were justified vis-à-vis fundamentals. Few studies have tried to argue for or against Fisher's thesis that the stock market was undervalued.

In this paper, we examined the crash of 1929 with the aid of historical data and modern theory. We find that a conservative estimate for the market value of U.S. corporations is no greater than 19 times corporate earnings (or 1.67 times GNP). We find that a conservative estimate for the fundamental value of U.S. corporations is no smaller than 20 times corporate earnings (or 1.78 times GNP). This comparison suggests that Irving Fisher was right to say that stock prices were low in 1929, even at their peak.

The year 1929 is similar in many ways to the year 2001. Empiricists look at past data, take averages, and state that things should remain as they were. (See, for example, Campbell and Shiller 2001.) Then, as now, empiricists claim that stock prices are too high because price-earnings ratios are above their historical averages. What we do in this paper instead is ask what *level* of the stock market is justified by the value of tangible and intangible assets owned by corporations.

Data Appendix

In this appendix, we describe sources for the data used in the figures and tables.

1. **Figure 1**
   (a) **After-tax corporate profits, prior to 1929**: Table A1.
   (b) **After-tax corporate profits, 1929 and later**: www.bea.doc.gov/dn1.htm, NIPA Table 1.14.
   (c) **GNP, prior to 1929**: Romer (1989), Table 2.
   (d) **GNP, 1929 and later**: www.bea.doc.gov/dn1.htm, NIPA Table 1.9. Also used for Figures 2, 3, and 4.
2. **Figure 2**
   (a) **Market Value of all listed NYSE Companies**: *Survey of Current Business, Annual Supplements*, various issues starting in 1932 (U.S. Commerce 1929–2000). Also used for Figure 3 and Table 3.
3. **Figure 3**
   (a) **Market Value of all U.S. Corporations**: *Flow of Funds Accounts of the United States* (Federal Reserve Board 1945–2000). Add market value of domestic corporations in Table L213 to the sum of net debt (= total liabilities − total financial assets + corporate equities held directly or in mutual funds) from Tables L102, L109, L114, L115, L118, L124, L126, L127, L130.
4. **Figure 4**
   (a) **Domestic tangible corporate capital**: www.bea.doc.gov/dn1.htm, Fixed Assets Tables 7 and 9.
   (b) **Inventories**: balance sheet reported in *Statistics of Income, Corporation Income Tax Returns*, various issues (U.S. Treasury 1913–1997).

5. **Figure 5**

   (a) **Moody's corporate bond yields**: unweighted average yields based on 60 corporate bonds before 1928, and 120 in 1928 and after, Federal Reserve Board (1943), Table 128.

   (b) **Long-term U.S. bond yields**: unweighted average yields of government bonds due or callable after 12 years, Federal Reserve Board (1943), Table 128.

   (c) **Intermediate-term U.S. bond yields**: average yields of government bonds with maturity near five years, Ibbotson Associates (2000), Table A-13.

6. **Figure 6**

   (a) **Short-term Interest rates**: Federal Reserve Board (1943), Table 115: Federal Reserve Bank Discount Rates on Eligible Paper; Table 120: Short-term Open-Market Rates in New York City; Table 122: Yields on short-term U.S. government securities; Table 128: Bond Yields, by type of security.

7. **Table A1**

   (a) **NIPA Profits after-tax, 1925–1928**: all original data sources listed in U.S. Commerce (1985, Table 3). Some data are missing because they are not in the public domain. Any missing figures appear in bold and are estimated to be proportional to "Total receipts less total deductions" with the factor of proportionality equal to the 1929 ratio.

8. **Table A2**

   (a) **Company list for S&P**: Standard and Poor's (1990, p. 115).

   (b) **Market Values for S&P**: CRSP monthly stock database.

   (c) **Earnings for S&P**: Moody's Investor Services (1930) and Poor's Publishing Company (1930).

9. **Table 1**

   (a) **Number of listed NYSE Companies**: New York Stock Exchange (1960, Historical section).

   (b) **Market Value of 135 Industrials**: Sloan (1936, p. 5).

   (c) **Company list, Market Values, Earnings for S&P**: See Table A2.

   (d) **Price-Earnings of 48 Industrials**: Fisher (1930, Chart 11, p. 86).

   (e) **Market Value, All corporations**: Jovanovic and Rousseau (2001), www.econ.nyu.edu/user/jovanovi.

10. **Table 2**

   (a) **Tax rate on profits**: ratio of 'Profits tax liability, NIPA' to 'Profits before taxes, NIPA' in Table A1.

   (b) **Tax rate on dividends**: the source of the data are *S*tatistics of Income, Basic Tables for Individual Returns, Tables 2 and 7, and Instructions for 1040 which have the surtax rates. Tax rates are constructed as follows: we take the ratio of 'Net income' to 'Number of Returns' for each net income class from Table 2; we find the marginal surtax rate for that net income class in the 1040 instructions; we multiply the marginal surtax rate for each net income class by the fraction of dividend income earned by that class found in Table 7; and we add across classes to get a weighted average.

11. **Other Data cited in Text**

   (a) **Population**: www.census.gov/population/estimates/nation/popclockest.txt, Table 16 of Population and Housing Unit Counts, CPH-2-1. in *Census of Population and Housing* (U.S. Bureau of the Census 1990).

   (b) **GNP deflator**: Romer (1989), Table 2.

Table A1. Relation of Corporate Profits and Taxes in NIPA and IRS

	1925	1926	1927	1928	1929
Total receipts less total deductions, IRS	9.3	9.5	8.7	10.7	11.9
Plus: Adjustment for misreporting on income tax returns	**.5**	**.6**	**.5**	**.5**	.7
Posttabulation amendments and revisions	**.1**	**.1**	**.1**	**.1**	.1
Income of organizations not filing corporation income	.0	.0	.0	.0	.1
Depletion on domestic minerals	.5	.6	.5	.5	.6
Adjustment to depreciate expenditures for mining exploration	**.1**	**.1**	**.1**	**.1**	.1
State and local corporate profits tax accruals	.1	.1	.1	.1	.1
Bad debt adjustment	**.7**	**.7**	.8	.8	.9
Net income received from equities in foreign corporations	**.2**	**.2**	**.2**	**.2**	.2
Less: Tax-return measures of:					
Gains, net of losses, from sale of property	**.5**	**.6**	**.5**	**.6**	.7
Dividends received from domestic corporations	1.2	1.5	1.7	1.9	2.6
Income on equities in foreign corporations and branches	**.3**	**.3**	**.3**	**.4**	.4
Costs of trading or issuing corporate securities	**.2**	**.2**	**.2**	**.3**	.3
Equals: Profits before taxes, NIPA	9.3	9.3	8.3	9.9	10.6
Federal income and excess profits taxes, IRS	1.2	1.2	1.1	1.2	1.2
Plus: Posttabulation amendments and revisions	**.1**	**.1**	**.1**	**.1**	.1
Amounts paid to U.S. Treasury by Federal Reserve banks	.0	.0	.0	.0	.0
State and local corporate profits tax accruals	.1	.1	.1	.1	.1
Less: U.S. tax credits claimed for foreign taxes paid	.0	.0	.0	.0	.0
Equals: Profits tax liability, NIPA	1.4	1.4	1.3	1.4	1.4
Profits after tax, NIPA	7.9	7.9	7.0	8.5	9.2
Profits after tax relative to GNP (%)	8.7	8.1	7.3	8.7	8.8

Table A2. Market Value at Month-End August 1929 and Net Earnings for 1929, All Companies in S&P Composite Index

Companies	Market Value (millions)	Net Earnings (millions)	Price-earnings Ratio
50 Industrials			
General Motors	3,132.0	236.5	13.2
General Electric	2,852.0	77.3	36.9
U.S. Steel	2,086.1	172.4	12.1
Standard Oil of New Jersey	1,753.1	120.9	14.5
Union Carbide & Carbon	1,114.1	35.4	31.4
Anaconda Copper	1,060.3	69.1	15.3
Woolworth (F.W.)	967.7	35.7	27.1
Standard Oil of California	963.4	46.6	20.7
Allied Chemical & Dye	762.3	27.4	27.8
Sears, Roebuck	754.8	30.1	25.1
Texas Company	685.7	48.3	14.2
Radio Corp.	647.5	11.5	56.4
Reynolds Tobacco	603.5	32.2	18.7
International Nickel	598.9	20.2	29.7
International Harvester	590.2	31.3	18.8
Eastman Kodak	483.9	21.6	22.4
American Radiator & Standard Sanitary	478.6	19.4	24.6
Standard Brands	476.3	17.3	27.5
American Can	440.4	19.8	22.2
Kresge (S.S.)	438.7	14.8	29.6
National Biscuit	436.0	19.7	22.1
Kennecott Copper	418.9	52.1	8.0
American Tobacco	394.3	27.0	14.6
Burroughs Adding Machine	352.5	11.7	30.2
General Foods	340.5	19.4	17.5
Bethlehem Steel	331.5	35.2	9.4
United Fruit	314.3	17.8	17.7
Pullman, Inc.	290.3	17.7	16.4
Timken Roller Bearing	261.5	14.2	18.5
Chrysler Corp.	300.9	21.9	13.7
American Smelting & Refining	226.9	18.3	12.4
Westinghouse Air Brake	203.8	8.8	23.1
Goodyear Tire & Rubber	204.5	13.1	15.7
National Cash Register	151.6	6.2	24.3
Paramount Publix	146.7	15.5	9.4
St. Joseph Lead	138.9	7.5	18.6
American Locomotive	94.2	4.2	22.7
Allis Chalmers	90.8	4.3	21.0
Stewart Warner	84.2	6.8	12.3
U.S. Rubber	75.3	−2.7	−27.8
International Paper	74.3	−4.3	−17.2
Briggs Manufacturing	73.6	2.4	30.3
Twentieth Century–Fox Film Corp.	65.0	8.4	7.7
American Sugar Refining	35.3	3.5	10.1
Abitibi Paper	27.5	1.9	14.1
Endicott Johnson	26.6	2.0	13.0
Armour and Co.	13.5	0.8	16.5
Cuban American Sugar	12.8	1.1	12.0
American Woolen	6.6	−4.2	−1.6
International Mercantile Marine	3.0	2.4	1.2
Total, 50 Industrials	26,085.5	1,420.8	18.4

Table A2 (cont.)

Companies	Market Value (millions)	Net Earnings (millions)	Price-earnings Ratio
20 Railroads			
Pennsylvania R.R.	1253.0	101.4	12.4
New York Central	1187.3	78.1	15.2
Canadian Pacific	772.2	36.8	21.0
Atchison, Topeka & Santa Fe	717.2	54.8	13.1
Union Pacific	655.8	45.3	14.5
Southern Pacific	572.6	34.4	16.7
Chesapeake & Ohio	409.4	32.2	12.7
Baltimore & Ohio	348.0	26.4	13.2
Norfolk & Western	332.2	40.9	8.1
Great Northern	311.4	25.7	12.1
Delaware, Lackawanna & Western	276.2	13.3	20.7
Northern Pacific	275.9	21.8	12.7
Southern Railway	197.6	15.1	13.1
Illinois Central	193.0	12.4	15.6
Reading Co.	185.7	18.3	10.1
Louisville & Nashville	176.7	13.7	12.9
Atlantic Coast Line	161.0	19.9	8.1
Chicago & North Western	158.9	14.0	11.3
Lehigh Valley	112.5	7.4	15.3
New York, Chicago & St. Louis	64.8	5.2	12.4
Total, 20 Railroads	8,361.2	617.0	13.6
20 Public Utilities			
Consolidated Edison of New York	1887.0	32.1	58.7
United Gas Improvement	1098.0	27.6	39.7
North American Co.	942.4	27.0	34.9
Columbia Gas system	850.9	26.4	32.2
International Telephone & Telegraph	685.6	17.7	38.7
Public Service of New Jersey	532.0	22.1	24.1
American Power & Light	351.9	3.3	105.4
Detroit Edison	348.1	13.1	26.5
Pacific Gas & Electric	283.1	10.9	26.0
American Water Works & Electric	281.6	6.6	42.5
Standard Power & Light	245.6	7.5	32.9
Western Union Telegraph	233.4	17.5	13.4
Peoples Gas of Chicago	209.4	6.3	33.3
Southern California Edison	202.3	7.7	26.1
Pacific Telephone & Telegraph	191.5	10.7	17.9
National Power & Light	171.5	11.8	14.5
Brooklyn Union Gas	125.5	5.6	22.6
Brooklyn-Manhattan Transit	45.8	5.0	9.1
Twin City Rapid Transit	9.0	1.0	8.6
Interborough Rapid Transit	7.4	3.1	2.4
Total, 20 Public Utilities	8,702.1	263.1	33.1
Weighted Total, 90 Composite	16,403.8	863.6	19.0

Notes

[1]See, for example, Hamilton and Whiteman 1985 and Flood and Hodrick 1990. The same critique can be applied to DeLong and Shleifer 1991, who argue that the high premia paid for closed-end funds in 1929 was "excessive optimism." It is difficult to determine whether investors were irrational or had very favorable expectations about the specialized skills of the fund managers.

[2]For an estimate of 20, we need to assume that real interest rates were high and market participants were quite risk averse. If we use more reasonable (lower) values for the real interest rate and the level of risk aversion, we get fundamental values of U.S. corporations higher than 20 times earnings.

[3]Prices fell roughly 30 percent between the end of August and the end of December. If we multiply our estimate of the price-earnings ratio for the end of August by 0.7, we find 13.3. This is equal to the ratio of the end-of-year market capitalization to 1929 earnings reported in the *S&P Security Price Index Record* (Standard and Poor's 1990).

[4]Thus, any measure that we can get of the value of corporate equity in 1929 would overstate the total value of the corporations, equity plus debt.

[5]The normal tax was not assessed on dividend income.

[6]We should note that most short-term rates were also below 6 percent during the period 1925–1929. The exception is brokers' loan rates which were temporarily high in 1929 due to actions of the Federal Reserve.

[7]Furthermore, it is not clear what connection there is between broker loans and the value of the stock market. Rappaport and White (1993), for example, establish no such connection.

References

Attanasio, Orazio and Guglielmo Weber. 1995. Is consumption growth consistent with intertemporal optimization? Evidence from the consumer expenditure survey. *Journal of Political Economy* 103:1121-57.

Browning, Martin, Lars P. Hansen, and James J. Heckman. 1999. Micro data and general equilibrium models, in J. Taylor and M. Woodford, eds. *Handbook of Macroeconomics*, Vol. 1A (Amsterdam: North Holland).

Campbell, John Y. and Robert J. Shiller. 2001. Valuation Ratios and the Long-run Stock Market Outlook: An Update. National Bureau of Economic Research Working paper 8221.

DeLong, J. Bradford and Andrei Shleifer. 1991. The stock market bubble of 1929: Evidence from closed-end mutual funds. *Journal of Economic History* 51:675-700.

Dominguez, Kathryn M., Ray C. Fair, and Matthew D. Shapiro. 1988. Forecasting the Depression: Harvard versus Yale. *American Economic Review* 78:595-612.

Federal Reserve Board of Governors. 1945–2000. *Flow of Funds Accounts of the United States* (Washington, DC: Federal Reserve Board).

Federal Reserve Board of Governors. 1929. *16th Annual Report of the Federal Reserve*, (Washington, DC: Federal Reserve Board).

Federal Reserve Board of Governors. 1943. *Banking and Monetary Statistics, 1914-1941* (Washington, DC: Federal Reserve Board).

Fisher, Irving. 1930. *The Stock Market Crash – and After* (New York: Macmillan Company).

Flood, Robert P. and Robert J. Hodrick. 1990. On testing for speculative bubbles, *Journal of Economic Perspectives* 4:85-101.

Galbraith, John Kenneth. 1954. *The Great Crash 1929* (Boston: Houghton Mifflin Company).

Hamilton, James D. and Charles H. Whiteman. 1985. The observable implications of self-fulfilling expectations. *Journal of Monetary Economics* 16:353-74.

Hurd, Michael D. 1989. Mortality risks and bequests. *Econometrica* 57:779-813.

Ibbotson Associates. 2000. *Stocks, Bonds, Bills and Inflation 2000 Yearbook* (Chicago: Ibbotson Associates, Inc.).

Jovanovic, Boyan and Peter L. Rousseau. 2001. Liquidity effects in the bond market. Working paper, New York University.

Lucas, Robert E., Jr. 1990. Supply-side economics: An analytical review. *Oxford Economic Papers* 42:293-316.

McGrattan, Ellen R. 1994. The macroeconomic effects of distortionary taxation. *Journal of Monetary Economics* 33:573-601.

McGrattan, Ellen R. and Edward C. Prescott. 2000. Is the stock market overvalued? *Federal Reserve Bank of Minneapolis Quarterly Review* 24(Fall): 20-40.

McGrattan, Ellen R. and Edward C. Prescott. 2001. Taxes, regulations, and asset prices. Working paper 610, Federal Reserve Bank of Minneapolis.

Moody's Investor Services. 1930. *Moody's Manual of Investments, American and Foreign*, Industrial and Public Utility Securities (New York: Moody's Investor Services).

New York Stock Exchange. 1960. *NYSE Fact Book* (New York: New York Stock Exchange).

Poor's Publishing Company. 1930. *Poor's Railroad and Bank Section* (New York: Poor's Publishing).

Rappaport, Peter and Eugene N. White. 1993. Was there a bubble in the 1929 stock market? *Journal of Economic History* 53:549-74.

Romer, Christina D. 1989. The prewar business cycle reconsidered: New estimates of gross national product, 1869–1908. *Journal of Political Economy* 97:1-37.

Rosenzweig, Mark R. and Kenneth I. Wolpin. 1993. Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries:

Investments in bullocks in India. *Journal of Political Economy* 101:223-244.

Sloan, Laurence and Associates. 1936. *Two Cycles of Corporation Profits* (New York: Harper & Brothers).

Standard and Poor's. 1990. *Security Price Index Record* (New York: S&P Corporation).

U.S. Bureau of the Census, Population Division. 1990. *Population and Housing Unit Counts*, CPH-2-1 (Washington, DC: U.S. Government Printing Office).

U.S. Department of Commerce. 1929–2000. *Survey of Current Business* (Washington, DC: U.S. Government Printing Office).

U.S. Department of Commerce, Bureau of Economic Analysis. 1985. *Methodology Papers: U.S. NIPA Corporate Profits: Profits Before Tax, Profits Tax Liability, and Dividends* (Washington, DC: U.S. Government Printing Office).

U.S. Treasury Department. 1913–1997. *Statistics of Income* (Washington, DC: U.S. Government Printing Office).

Figure 1.

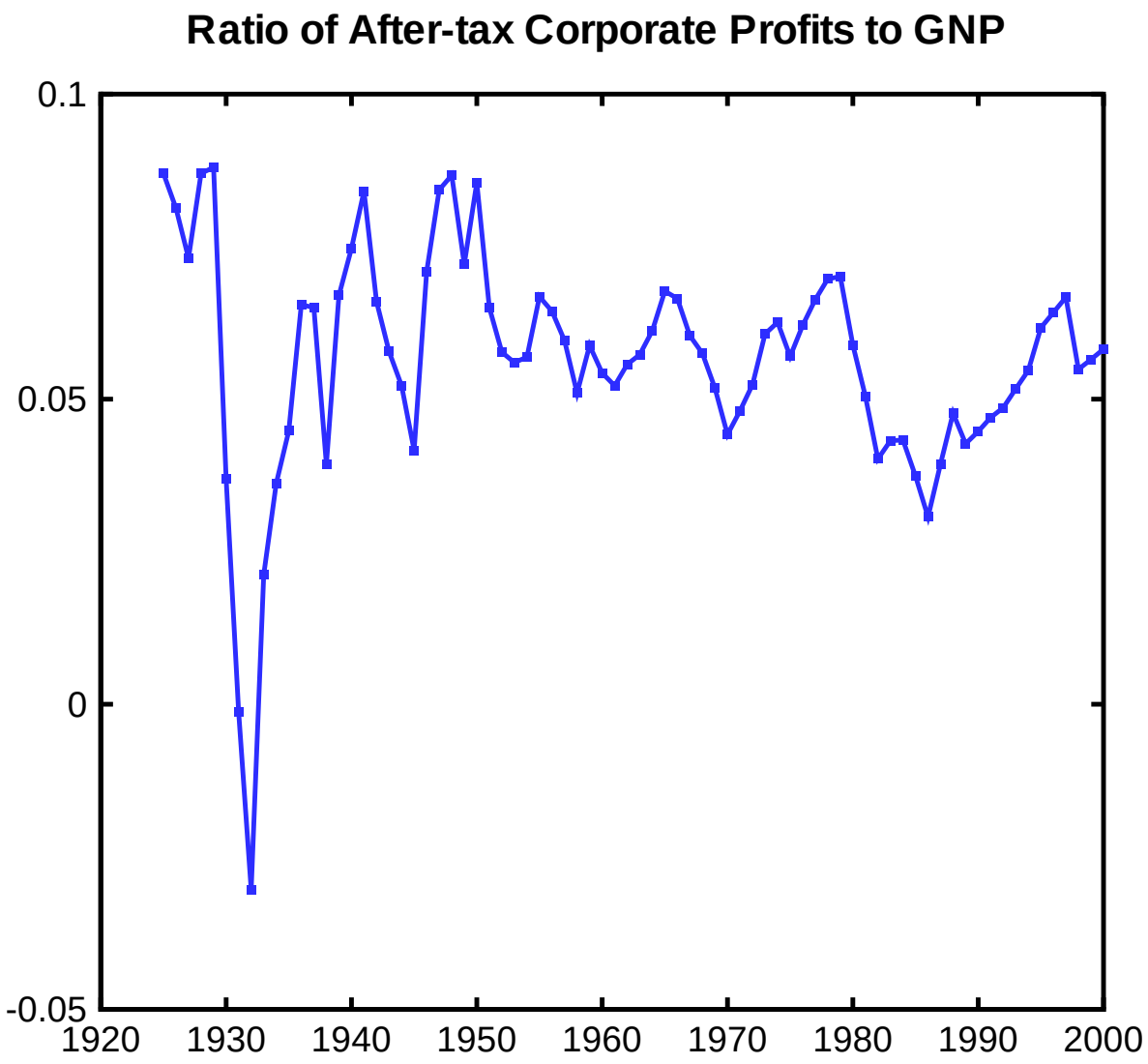
Ratio of After-tax Corporate Profits to GNP
0.1
0.05
0
-0.05
1920
1930
1940
1950
1960
1970
1980
1990
2000

Figure 2.

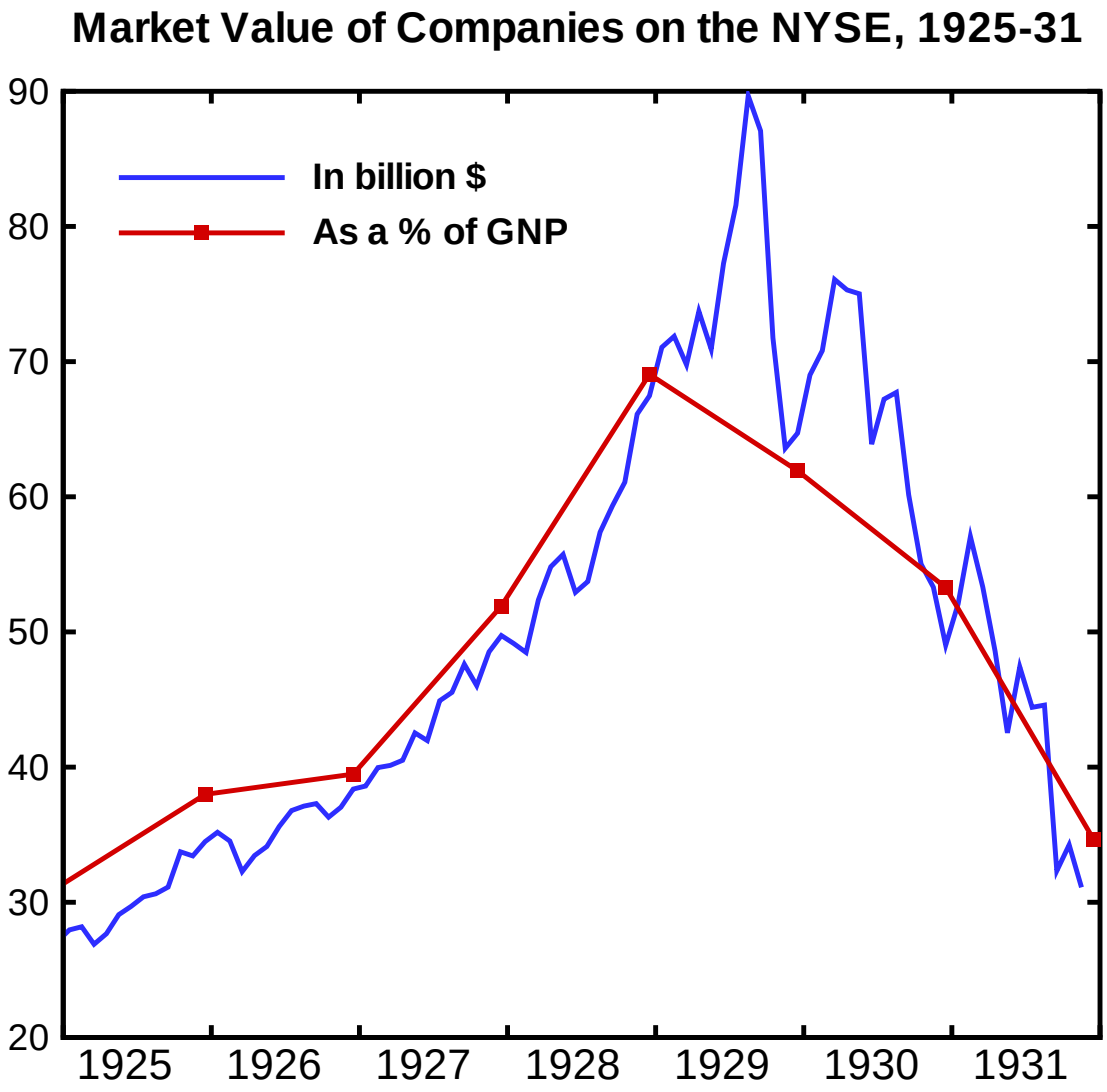
Market Value of Companies on the NYSE, 1925-31
In billion $
As a % of GNP
90
80
70
60
50
40
30
20
1925
1926
1927
1928
1929
1930
1931

Figure 3.

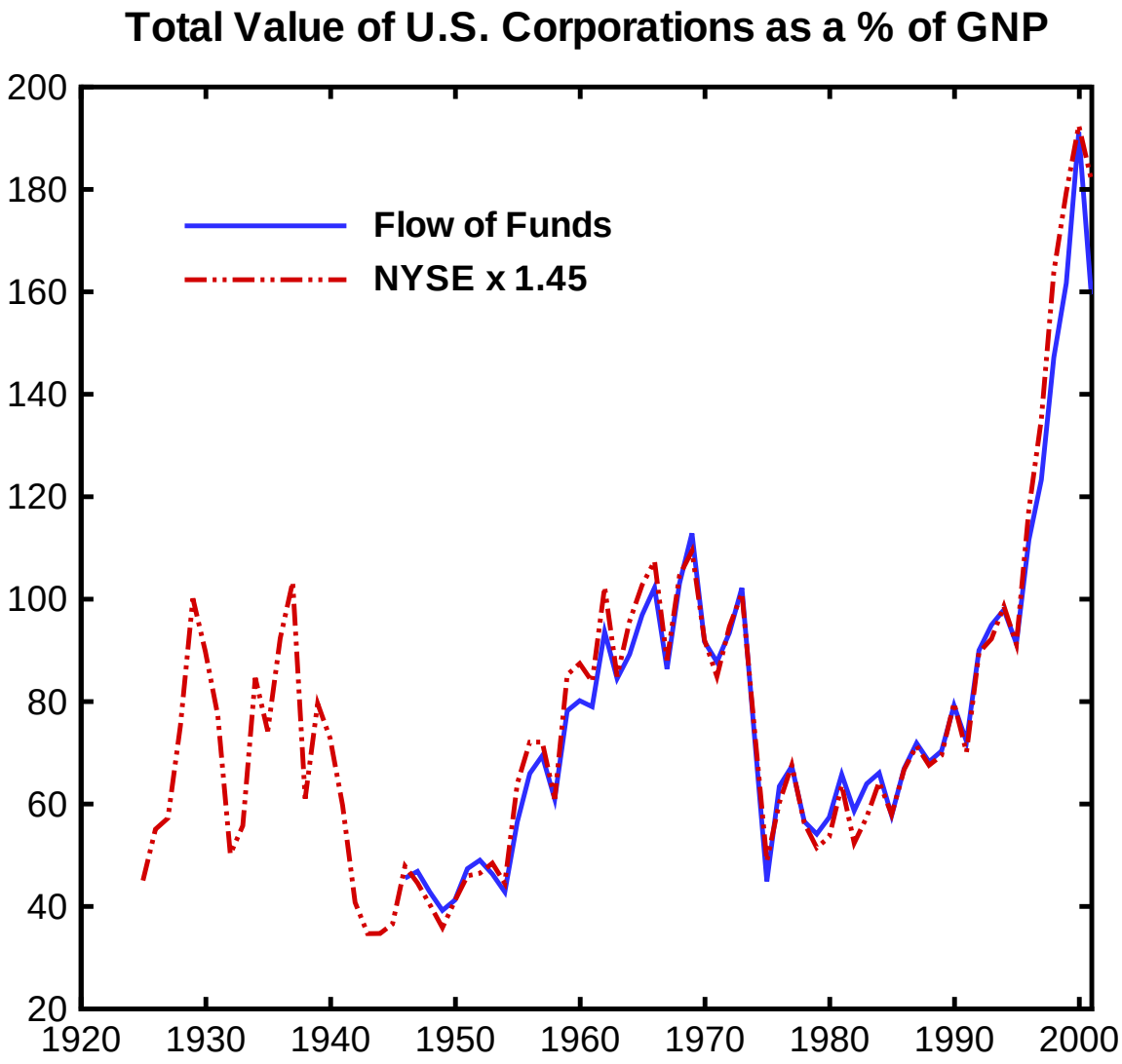
Total Value of U.S. Corporations as a % of GNP
Flow of Funds
NYSE x 1.45
200
180
160
140
120
100
80
60
40
20
1920
1930
1940
1950
1960
1970
1980
1990
2000

Figure 4.

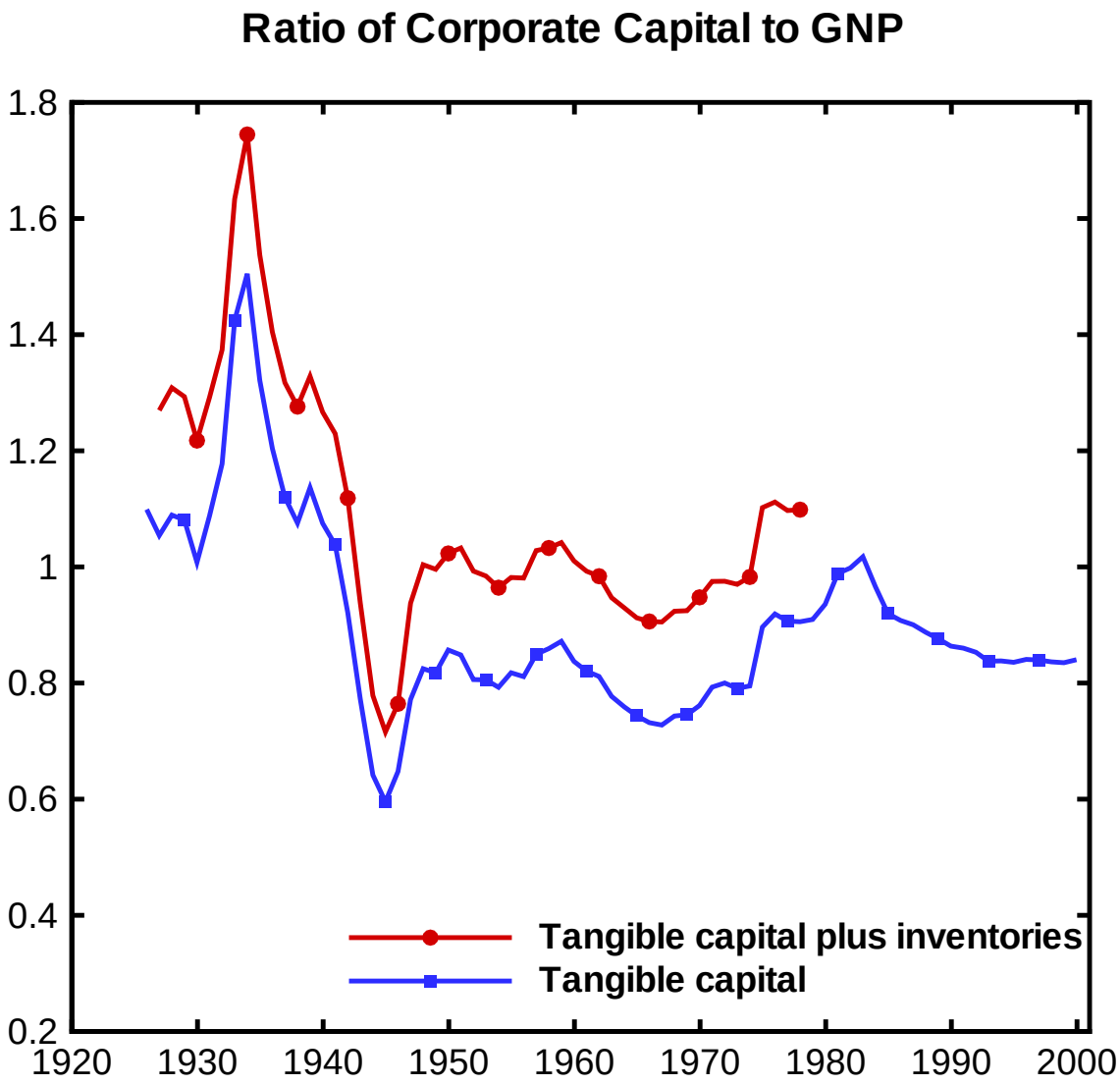
Ratio of Corporate Capital to GNP
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
1920
1930
1940
1950
1960
1970
1980
1990
2000
Tangible capital plus inventories
Tangible capital

Figure 5.

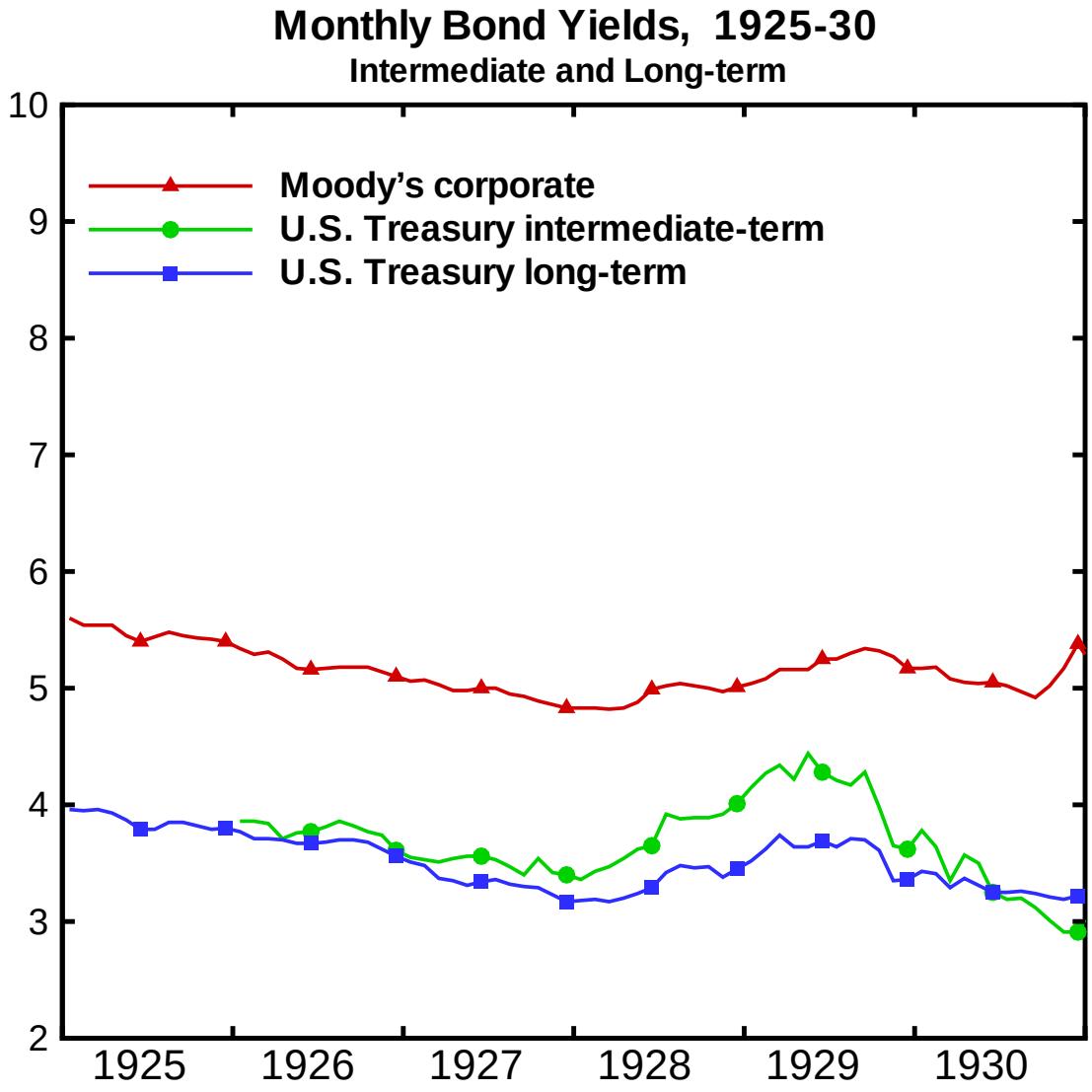
Monthly Bond Yields, 1925-30
Intermediate and Long-term
Moody's corporate
U.S. Treasury intermediate-term
U.S. Treasury long-term
10
9
8
7
6
5
4
3
2
1925
1926
1927
1928
1929
1930

Figure 6.

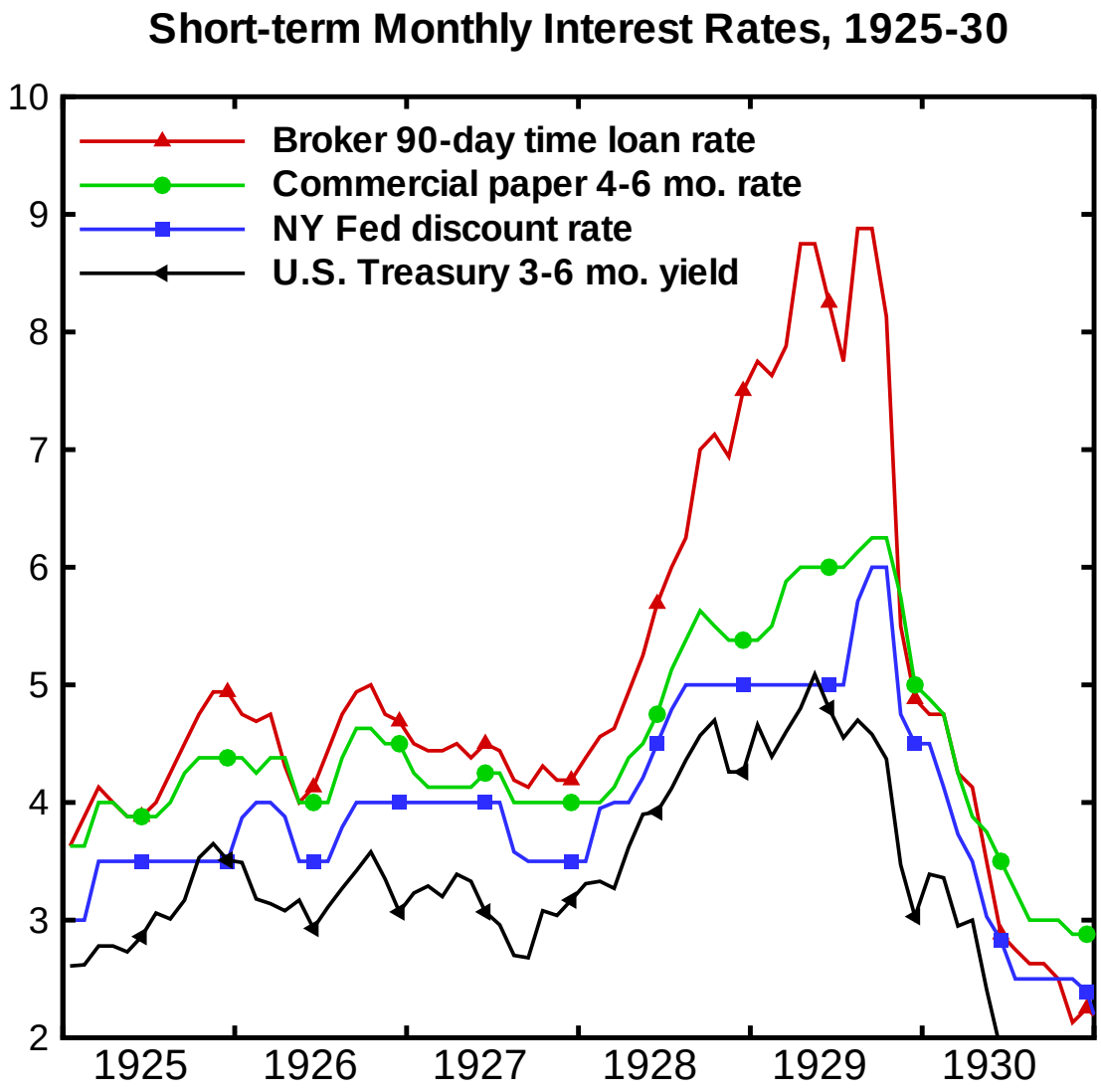
Short-term Monthly Interest Rates, 1925-30
Broker 90-day time loan rate
Commercial paper 4-6 mo. rate
NY Fed discount rate
U.S. Treasury 3-6 mo. yield
10
9
8
7
6
5
4
3
2
1925
1926
1927
1928
1929
1930

Table 1. Estimates of Market Value of All U.S. Corporations on August 30, 1929
Based on Information for Subsets of Corporations

Data Source[†]	Company Coverage	Market Value ($ billion)	Price/ Earnings	Estimated Total Market Value/ GNP
Sloan & Associates 1936	135 Industrials	30.8	17.5	1.54
CRSP & *Moody's Manual*	50 S&P industrials	26.2	18.4	1.62
CRSP & *Moody's* & *Poor's Manuals*	90 S&P composite	43.3	19.0	1.67
Irving Fisher 1930	45 Industrials		14.1	1.24
NYSE & *Flow of Funds Accounts*	846 listed on NYSE	89.7	14.1	1.24
Jovanovic and Rousseau 2001	All corporations	130.6[‡]		1.25[‡]

[†] CRSP = Center for Research on Security Prices and NYSE = New York Stock Exchange

[‡] End-of-year estimate was divided by 0.7 because prices fell 30 percent between August and December.

Table 2. Marginal Tax Rates on Corporate Income, 1925–1929

	Tax Rate on	
Year	Profits	Dividends
1925	15.1	9.8
1926	15.1	10.0
1927	15.7	10.2
1928	14.1	11.0
1929	13.2	10.3
Average	14.6	10.3

Table 3. Estimates of Intangible Capital and the Fundamental Value of U.S. Corporations in August 1929 for Various Real Interest Rates

Real Interest Rate (%)	Estimates of	
	Fundamental Value/ GNP	Market Overvaluation† (%)
5.00	2.75	−39
5.25	2.33	−28
5.50	2.01	−17
5.75	1.78	−6
6.00	1.59	5
6.25	1.43	16
6.50	1.32	27
6.75	1.21	38
6.93	1.14	46

† Assuming a market value of 1.67 times GNP.