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THE STABILIZATION OF THE U.S. ECONOMY
EVIDENCE FROM THE STOCK MARKET

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ABSTRACT

Until recently, economists widely believed that economic activity had become less variable in the United States following the end of World War II. Challenging this belief, new research suggests that key historical time series are spuriously volatile, a finding that is highly controversial. Data from the stock market may provide a vehicle for resolving the controversy. Economic theory relates stock prices to real activity; empirical tests also show a strong link between stock prices and activity. Financial data are accurately measured over long spans of time and hence are free of most of the measurement problems in other time series. Measures of stock prices show no stabilization in the post-World War II period relative to the pre-World War I or pre-Depression periods. These stock market data thus support the hypothesis that real activity has not been stabilized.

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Is the apparent stabilization of the post-war U.S. economy a "Figment of the data" as Christina Romer suggests in an important series of papers?[1] The answer to this question has clear and important implications for macroeconomic analysis and policy-making. Major economic time series as officially published show clear stabilization in the post-World War II era compared to earlier periods. This (apparent) fact is often taken as evidence that economic policy has been effective in reducing the magnitude of economic fluctuations.[2] The policies include activist monetary and fiscal policy and passive built-in stabilizers such as progressive income taxation, unemployment insurance, and deposit insurance.

In studies of a wide range of time series of interest to macroeconomists and policy makers, Romer finds that each series is too volatile in the early data. The excess volatility occurs for different reasons in the different series; Romer's findings do not point to a single methodological difficulty in the work of early researchers. It is accidental that each series is excessively rather than insufficiently volatile. According to Romer, the main source of the excess volatility in the unemployment series is interpolations of employment and labor force data that do not take into account the pro-cyclicality of productivity and

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[1]Romer (1986a, b, c).

[2]Bailey (1978).

participation. The main source of the excess volatility in the GNP data is an overstatement of co-movements of GNP and output of commodities.

Romer's findings have not gone unquestioned. David Weir (1986) offers an analysis of the original unemployment data that does suggest stabilization since the end of World War II. Nathan Balke and Robert Gordon (1986) present alternative pre-1929 estimates of GNP that also show stabilization. They find that calculations underlying the original GNP data did not overstate the relationship between commodity and non-commodity GNP. Moveover, they offer data on railroad transportation and construction--components of non-commodity GNP--that are more volatile than commodity output.

Further and even more detailed study of the underlying data is perhaps needed to resolve the impasse. I am skeptical, however, that such research would help most economists frame an opinion concerning the debate unless it were to lead to a consensus. The steps in constructing the data are complicated and require judgement.[3] Ultimately, only the participants in the debate may be able to make informed judgments about each of these detailed steps and how they color the final answer. Instead of reexamining the issues raised by Romer, Weir, and Balke and Gordon, I propose to examine the issue by using a completely different set of data, but one that in theory should be very useful in resolving the question raised by Romer.

I propose to use asset price data to study the volatility of real activity in the U.S. economy after World War II relative to earlier periods.

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[3]For example, some of the difference between Romer and Balke and Gordon arises through the choice of years for benchmarks.

Asset price data are particularly well-suited for addressing this issue for several reasons.

First, asset price data are usually much better measured than data on real economic activity. Aside from issues of data alignment and construction of index numbers, there is little doubt about what a time series of asset market data is measuring. There is no reliance on survey or census data, there is no need to interpolate data because prices are observed virtually continuously, and there is relatively little scope for judgement in the compilation of asset market statistics.

Second, data on stock prices are readily available over a long span on a consistent basis. There is no need to splice together series constructed with different techniques from different types of data.

Third, economic theory predicts that there should be a strong link between economic activity and asset values. The stock price is the discounted present value of the firm's payout. Insofar as this payout must ultimately be a function of real activity, there is a link between real activity and stock prices.

Finally, studies of the data confirm that stock prices are related to real economic activity. Stock prices are an important component in the U.S. Index of Leading Indicators.[4] The strong link between stock prices and activity has also been emphasized recently by Stanley Fischer and Robert Merton (1984). R. Officer (1973) finds a significant, positive relationship

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[4]See <u>Handbook of Cyclical Indicators</u>, 1984, p. 68.

between estimated volatility of aggregate stock prices and industrial production in post-World War I data.[5]

If the variance of the fundamentals is unchanged, so should be the variance of stock returns. Comparing these variances seems an important step in answering the question raised by Romer.

I. Link Between the Stock Prices and Economic Activity

This paper exploits the link between economic activity and the stock market to learn about the volatility of the economic activity. In this section, I discuss the theoretical linkage between stock price changes and changes in the fundamentals and evaluate some of the pitfalls in making inferences about the distribution of the fundamentals from the distribution of asset market data.

In a simple model, Robert Lucas (1978) shows that there is a unique relationship between the level of economic activity and the value of the stock market. The tight relationship between real activity and asset prices carries over to more complicated and realistic models where no simple solutions are available. Yet, the lessons from this paper do not rely upon a specific model of asset pricing. The null hypothesis is that the distribution of the fundamentals driving the economy has not changed. The validity of evaluating that hypothesis by examining asset returns only

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[5]Monthly data on industrial production is available beginning in 1919. For this study, one could envision estimating a relationship between output and stock market data in order to translate implications for stock volatility into those for output volatility. Given that doubts about the accuracy of the output data motivate this study, that line of research is not pursued here.

requires that the same model apply for all time periods of interest. The power of this approach derives from the quality of the asset market data rather than recourse to a parametric model of the relationship between fundamentals and asset prices.

In the conventional valuation model, stock prices are the present discounted value of future dividends. Despite doubts raised about how well this model fits the data [Robert Shiller (1981) and N. Gregory Mankiw, David Romer, and Matthew Shapiro (1985)], as long as stock values bear some relation to fundamental values, examination of stock market data should be useful in addressing the question of the volatility of the fundamentals. No rejections of the conventional valuation model suggest the complete absence of a relationship between real variables and asset prices. Indeed, Sanford Grossman and Shiller (1981) find that the consumption-based version of the conventional valuation model is broadly descriptive of U.S. data at least over some sub-samples. John Campbell and Shiller (1986) show that there is substantial evidence that price-dividend ratio reflects the rational expectation of future dividends. Finally, as long as the departures from the valuation model remain the same in the two sub-samples, testing whether asset data have equal or greater volatility in the two samples should be useful in testing whether the process for the fundamentals is the same in the sub-samples.[6]

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[6]All that is required is that variance of the "fad" component remains unchanged. This assumption is appropriate in testing the null hypothesis of no stabilization. If the fads component has a high variance, the power of the tests will, however, be low.

An objection to inferring changes in real activity from changes in market value is that the market value represents a long average of future real activity. Consequently, transitory movements in real activity will have little effect on market value. There is growing evidence, however, that changes in output are dominated by permanent or very persistent components [Charles Nelson and Charles Plosser (1982) and Campbell and Mankiw (1987)]. Under this statistical model of real activity, one would expect a tight relationship between innovations in activity and innovations in market value.

Changes in corporate financial structure will change the variability of stock prices even if the variability of the fundamentals remains unchanged [Fischer Black (1976)]. Specifically, an increase in leverage will increase stock volatility. Changes in leverage could therefore cause incorrect inferences about the variability of the fundamentals from the variability of stock returns. Data on the aggregate corporate balance sheet are available in a National Bureau of Economic Research study by Raymond Goldsmith, Robert Lipsey, and Morris Mendelson (1963) for selected years between 1900 and 1958 and in the Federal Reserve Board's Flow of Funds Accounts for years since 1946.[7] Table 1 gives debt-equity ratios for the aggregate U.S. nonfinancial corporate sector for certain years between 1900 and 1985. This ratio is defined as liabilities divided by the difference of assets and liabilities.

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[7] I have been unable to locate balance sheet data for years prior to 1900.

Assets are valued at replacement cost in current dollars.[8] In the years when the two series overlap, the Federal Reserve Board's series gives a substantially lower ratio.[9] Yet, the series move together closely in years when each is available; earlier data can be scaled down for comparability. Table 1 shows that the debt-equity ratio is substantially lower during the recent period compared with the earlier period. This alone should make the stock market more volatile in the earlier period. Changes in leverage bias tests of the stabilization hypothesis using the stock returns data in favor of the alternative that real activity has become less variable in recent years.

II. Variables and Data

In this section, I discuss the financial variables whose volatility I will study and the data used to measure them. I also address data problems that might arise in using these series to assess changes in volatility. The basic measure of volatility of the stock market will be the standard deviation of return on holding the stock market. The return--defined as capital gain plus dividend yield--is essentially distributed independently over time. Hence, the sample variance should be an unbiased estimate of the

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[8]This ratio is not the ratio of debt to the market value of equity, which is unavailable in the Goldsmith, Lipsey, and Mendelson data. The use of replacement cost valuation of equity to make the leverage comparisons across the decades is problematic only if the mean of Tobin's q differs over the sub-samples.

[9]The major difference between the two balance sheets is that the FRB consolidates the corporate sector by netting out most intra-sectoral assets (mainly securities) while the NBER researchers do not net out these assets. See Goldsmith, Lipsey, and Mendelson, 1963, p. 24.

population variance.[10] The raw stock market return is a nominal variable. Several approaches are taken to obtaining a real measure. The real return can be measured by deflating dividends and the stock prices by appropriate price deflators. Although this produces a theoretically valid measure of the real return, it does introduce non-financial data into the calculation. The excess return on the stock market over a short nominal interest rate can be measured by financial-market data alone. Finally, the nominal stock return is of independent interest. The mean of the rate of inflation has clearly changed over the last century.[11] If the variance of inflation is unchanged over the two periods, one can compare the variance of the nominal stock returns over the two periods as long as they are computed about different means. In any case, the excess, real, and nominal stock returns yield very similar results.

I also consider the price-dividend ratio. The price-dividend ratio is an attractive measure of movements in the stock market for two reasons. First, the price-dividend ratio can be stationary even if neither variable is. Hence, the price-dividend ratio is a measure of the level of the stock market that has a well-defined variance. Second, it is intrinsically a real measure.

In addition to these returns variables, I present statistics showing movements in dividends. The dividend is ultimately tied to the profits of

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[10]See Mankiw, Romer, and Shapiro (1985) and Marsh and Merton (1986) for a discussion of how serial correlation in measures of the level of stock prices (such as Shiller, 1981) can lead to serious bias in estimates of volatility.

[11]Robert Barsky (1987) argues persuasively that the mean inflation rate was essentially zero before 1914.

the underlying capital, so it is potentially an interesting indicator of activity. But the year-to-year link between the two may be weak if corporate dividend policy makes dividends respond slowly to changes in profits. I examine this issue in the next section. I present results for both log detrended and percent change in dividends because of the difficulty of establishing which procedure is the appropriate transformation to render the series stationary.[12]

In summary, the stock returns--nominal, real, and excess--are the major variables to be examined. These are supplemented by the price-dividend ratio and measures of change in dividends. I now turn to a discussion of the specific data used to measure these variables.

The statistics are computed for the period 1872 through 1987 and for various sub-periods. Although the underlying data are measured monthly, I consider variances measured for annual data.[13] The stock price is an index of industrial stocks. The stock price index refers to the month of January. For 1871 through 1925, the data are Cowles's (1939) All Stocks Index (series P-1). Since 1926, they are the Standard and Poor's Composite, which extends Cowles's series. The dividend data give the total dividends during the year (Cowles's series D_a-1 for 1871 through 1925 and the Standard and Poor's

[12]Campbell and Shiller (1986) reject the hypothesis that log dividends have a unit root in favor of a trend stationary alternative. They find, however, that the log dividend-price ratio is trend stationary while log prices are not. As they point out, these three findings are inconsistent.

[13]More precise estimates of the variance of stock price growth can be obtained by using higher frequency data, but the dividend data required to compute the returns are only available annually in the early period. Variances of stock price growth computed from the monthly data show the same pattern across time as the annual returns data used in this paper.

series since 1926). The returns are calculated for holding the index from January to January and are expressed as percentages.[14]

Except for the possibilities of errors in the transcription of the raw data underlying these series or arithmetic errors in constructing these series, we can be confident that these stock market data are accurate measures.[15] The monthly Cowles index is the average of the high and low for the month rather than the average of all the days. This procedure does not introduce important bias into the variance of the annual returns measure.[16]

The firms represented in the stock market index do not create all the output of the economy. Consequently, how well the stocks in the index represent the economy as a whole needs to be evaluated. The most dramatic change in the economy over the sample period is the reduction in the

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[14]The return is $100((P_{t+1} + D_t)/P_t - 1)$ where P_t is the January price and D_t is the calendar-year dividend. The price-dividend ratio is defined as P_t/D_{t-1}.

[15]Jack Wilson and Charles Jones (1987) examine the monthly Cowles price index for coding errors. They appear to have found an error in the June 1884 price. They also find problems in the Cowles cumulative returns series. They do not find problems with the data used in this paper.

[16]To check this, I carried out a simple simulation. I generated data assuming stock prices followed a geometric random walk at daily frequency with an innovation standard deviation of 16.0 percent annual rate. I generated data for forty years of data with 300 days per year. I then computed the standard deviation of the "January" to "January" returns using the Cowles and Standard and Poor procedures for obtaining monthly data. For Cowles, the January value was taken to be the average of the minimum and maximum observation during the first twenty-five days of the year; for the Standard and Poor, January was taken to be the average of the first 25 days. In 1000 replications, the mean absolute deviation of the standard deviation of the return measured by either the Cowles or Standard and Poor procedure averaged about three percent of the true standard deviation.

importance of agriculture. At the beginning of the sample, over half of output was in the agricultural sector; at the end, it was about two percent.[17] Clearly, farms are not traded on the stock exchange although the returns to industrial companies are likely to be affected by agricultural shocks. That stock market data exclude the direct contribution of the farm sector is probably a virtue. The debate over the stabilization of the economy centers on changes in government policies and institutions that are unlikely to affect year-to-year movements in agricultural output. Hence, it is appropriate to use measures that apply to the industrial sector as evidence in the stabilization debate.

Within the industrial sector and within the stock market index, the composition of firms has changed over the sample. For example, railroads were much more important in the earlier period than they have been in the recent period. Changes in the mix of stocks in the index should reflect changes in the mix of economic activity. To make inferences about the volatility of the fundamentals from the volatility of asset returns requires that that relationship between the returns on the major companies in the economy and the underlying economic activity has not changed over the sample period. This maintained hypothesis seems an appropriate component of the complicated, composite hypothesis that the volatility of the economy in unchanged. Nonetheless, the limited coverage of the stock price index and of the stock market itself is a drawback of the approach in this paper.

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[17]In 1869, agricultural output was 2.54 billion dollars and total output was 4.83 (Historical Statistics, series F238 and F240). In 1986, agricultural output was 93.0 billion dollars and the total was 4,235.0 billion dollars (Economic Report of the President 1988, Table B-10).

To obtain a real return, stock prices are deflated by an index of the monthly wholesale price and dividends by an index for the calendar year. For 1871-1889, the price index is the George Warren and Frank Pearson (1935, Table 1) series.[18] Since 1890, it is the Bureau of Labor Statistics Wholesale Price Index (now called the Producer Price Index).[19] The stock price is deflated by the January price index; the dividend by the calendar year index. Deflating by this price index might introduce a number of problems in calculation of the returns volatility. Measured price indexes might be too stable if they are based on posted or administered prices rather than market prices. On the other hand, the producer price index might be an excessively volatile measure of inflation. First, producer prices are more variable than consumer prices, at least in recent data.[20] Second, there is an important bias in the retrospective work to construct the historical data. The price data that is easily collected tends to be on commodities that are traded in asset markets. These commodity prices are certainly more volatile than average producer prices. Therefore, it is very difficult even to sign the bias in the volatility of the inflation rate. In

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[18]The annual Warren and Pearson series is also in Historical Statistics of the United States, Series E-52.

[19]The annual wholesale price index is Series E-23 in Historical Statistics. The monthly series is in the BLS LABSTAT file beginning in 1913. The monthly series from 1890 through 1912 is from Bureau of Labor Statistics, Index Number of Wholesale Prices on Pre-War Base, 1890-1927 (Washington: GPO, 1928).

[20]Over 1948 through 1988, the standard deviation of annual inflation (January to January) is 5.4 percent measured by the Producer Price Index and 3.5 percent by the Consumer Price Index.

practice, the volatility of the nominal returns swamps the inflation volatility in the calculation of real returns.

Moreover, as noted above, consideration of the excess return avoids having to introduce measurement errors in a price index. For this span of data, the short term commercial paper rate provides a measure of a short term, low-risk interest rate. The interest rate is the annual six-month commercial paper rate on a bank discount basis published in the Federal Reserve Bulletin. It is linked to the four to six month commercial paper rate in Milton Friedman and Anna Schwartz (1982).

III. Results

The basic facts about the variability of the asset market data emerge clearly in Figures 1 through 5, which present the levels and rolling estimates of the standard deviations of the excess and real stock returns, the price-dividend ratio, dividend growth, and detrended dividends. The level of the series are plotted as solid lines. The standard deviations of the series are computed over rolling, eleven year sample intervals. These are plotted as broken lines at the mid-point of the intervals. There is no apparent stabilization of either the real or excess stock returns, although volatility increased in the inter-war period.[21] The price-dividend ratio is

[21] Officer also finds that the Depression years were especially volatile. He emphasizes that stabilization of the stock market following the Depression cannot be attributed to the creation of the Securities Exchange Commission because post-World War II volatility is no greater than that in the first two decades of the twentieth century. G. William Schwert (1987) finds that high frequency changes in stock volatility are not closely related to changes in volatility of either macroeconomic variables or leverage. He does find increases in volatility during the inter-war period.

more volatile in recent years.[22] Dividend growth alone does show some stabilization after World War II.

Sample statistics confirm what the eye sees in the figures. Table 2 gives the sample standard deviations of the series for the entire sample and for selected sub-samples. The sub-samples are 1872-1913, 1872-1929, 1914-1946, and 1947-1987. The first two sub-samples are based on alternative ending dates for the earlier period. The first sub-sample ends with the beginning of World War I, the collapse of the classical gold standard, and the founding of the Federal Reserve. The second sub-sample ends with the stock market crash. The third sub-sample includes the turbulent years from the beginning of World War I through the recession following World War II.

The standard deviations of both real stock returns and of the price-dividend ratio are lower in the early period (ending in either 1913 or 1928) than in the period after World War II. Excess returns have about the same variability in the earlier periods and the recent period. The variability of the stock market is consistent with the hypothesis that real activity in the U.S. has not been stabilized. Only dividend growth shows substantial stabilization in the recent period.

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[22]Note that changes in the price-dividend ratio presented in Figure 3 can be interpreted in terms of changes in the required rate of return. High price-dividend ratios correspond to low required rates of return. Figure 3 suggests that the required rate of return was lower in the post-World War II period than in the pre-World War I period, but that both the early and later periods had lower required rates of return than the middle period. James Poterba and Lawrence Summers (1986) examine the relationship between volatility, stock returns, and the required rate of return. They find volatility changes are not persistent enough to yield large changes in the required rate of return.

Table 3 gives formal tests of the null hypothesis that the variance of the series in the 1872-1913 and 1947-1987 sub-samples are the same. The first column presents the ratio of the variances in the two sample periods. The second column gives a test statistic for the hypothesis that the variances are equal.[23] The third column gives one minus the probability of rejecting that the variances are equal. The test statistics confirm what is apparent from the figures and from Table 2. Only for dividend growth can one come close to rejecting the hypothesis that the variance of the series are the same in favor of the hypothesis that it is smaller in the more recent data.[24]

Of the asset market data, only dividend growth shows stabilization in the post-War period. Dividends paid are ultimately constrained by the real return on the underlying asset. But as Marsh and Merton (1986) stress, the timing of dividend payments is largely at the discretion of management. The smoothing of dividends in the post-War period may well reflect a change in

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[23]Because the series may be serially correlated (serial correlation is non-trivial in the price-dividend ratio and the dividend series), Goldfeld-Quandt tests of equal variance are not appropriate. The probabilities reported in Table 3 are for a test that is valid under very general forms of serial correlation. It is constructed by regressing squared deviations from sub-sample means on dummies for the sub-periods and testing whether the dummies have equal coefficients. The test statistic is based on a covariance matrix corrected for heteroskedasticity and autocorrelation (8-quarter lags) within the sub-sample but assuming that observations are uncorrelated across sub-samples. See Donald Andrews and Ray Fair (forthcoming) for a general treatment of tests for structural change with heterogenous processes.

[24]The test for real dividend growth illustrates the importance of taking into account the serial correlation in the time series. Even though the variance of real dividend growth is half of its pre-World War I value in the post-World War II period, the difference is not statistically significant using conventionally-sized tests.

dividend policy rather than a change in the underlying driving process. Suppose that managers, for example, decided to spread over several years changes in dividends that would have previously been made over one year. This change in policy would have little effect on the distribution of stock returns. Yet it would reduce the variance and increase the persistence of year-to-year changes in dividends. It is clear from the Figure 4 that the serial correlation of the dividend growth has increased since World War II.[25] This increased serial correlation is consistent with more smoothing of dividend changes. Tables 2 and 3 include statistics for the change in dividends measured over four years (expressed at annual rate). Although there is a decline in the variability of this series, it is much smaller than for the year-to-year changes.

Finally, all the measures considered show dramatic increases in volatility in the period between the beginning of World War I and the end of World War II. The finding accords with the volatile history of that period (the roaring twenties, the Great Depression, the World War II boom). The participants in the debates over the historical economic data do not dispute that this period saw an increase in volatility of real activity. Additionally, the large decline in the value of the stock market itself at the onset of the Depression would itself increase volatility through the leverage effect.

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[25]The first order serial correlation of dividend growth is essentially zero in the early period and is 0.30 in the later period.

IV. Discussion

The previous section documents that stock market returns show no reduction in variance when the pre-World War I or pre-Depression periods are compared to the post-World War II period. The lack of stabilization in stock prices supports the view that activity has not been stabilized.

It is inappropriate, of course, to offer evidence of the inability to reject a hypothesis as evidence for the hypothesis. Indeed, if one believes that the stock market is determined by fads or "will o' wisps" one might maintain that the test lacks power against the alternative that the variance of the fundamentals has changed. The variance of fundamentals could be overwhelmed by the variance of the fad component. In the worst case, all changes in stock market value are caused by speculative bubbles, but there is, as discussed above, evidence that does link the fundamentals to stock prices. Indeed, about forty to seventy percent of the standard deviation of the log dividend-price ratio can be explained by the rational expectation of future dividends and interest rates in the context of the conventional valuation model.[26] Given that the size of any fad component is thus circumscribed, the tests presented in this paper should have power against the alternative that the variance of the fundamentals has changed.

Another issue of power may arise if the stochastic process for output has shifted during the sample. The greater the persistence of the shocks to the fundamentals, the more the stock market will respond to an innovation of

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[26] See Campbell and Shiller (1986). Note that this finding is put forward by a strong proponent of fads models [Shiller (1984)]. Campbell and Shiller (1988) do find that a lower fraction of variance in the dividend-price ratio is explained when a long moving average of earnings is included in the information set.

a given size. Campbell and Mankiw (1987) find evidence that the persistence in shocks to output growth has increased in the U.S. since World War II. Consider the implications of the persistence of output fluctuations for the relationship between variance of output and variance of stock returns. The more persistent are changes in the fundamentals, the greater does the variance of stock returns magnify the variance of innovations in the fundamentals. Conversely, if the fundamentals are negatively autocorrelated, the stock return will respond little to an innovation in the fundamentals. In the limiting case where shocks to the fundamentals are perfectly transitory, for example, where a shock this period is offset by a shock of equal and opposite present value the next period, changes in fundamentals lead to virtually no changes in stock values. Suppose macroeconomic stabilization policies have reduced the variation in output by attenuating high frequency, negatively autocorrelated changes in output.[27] Under this view of policy, stabilization of output would leave the distribution of stock returns relatively unchanged, but year-to-year output changes could be reduced substantially. Hence, if stabilization policy operates only at the short end of the spectrum, stabilization may have been effective, but would go undetected by the tests in this paper. This line of reasoning also suggests that the debate over stabilization should focus more on high frequency movements in output rather than on total variability. Doing so will be difficult given the weakness and relatively low frequency

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[27]Dividend growth clearly shows greater persistence and lower innovation variance in recent years. As noted above, this change in the stochastic process for dividends could be caused by a change in firms' dividend policies.

of the existing data. In any case, the findings of this paper rule out stabilization at the long end of the spectrum. Any defence of the stabilization hypothesis must therefore point to high frequency output fluctuations in the early period that have disappeared in recent years.

In summary, financial data provide an excellent vehicle for testing whether real activity has been stabilized when the direct data on real activity are suspect. The financial data are available over a long span, are accurately measured, and are related in theory and in practice to real activity. Stock returns since World War II have essentially the same variance as in earlier periods. Given the evidence that innovations in output are essentially permanent, the constant variance of stock returns supports Romer's important finding that the stabilization of the post-World War II economy is illusory.

Table 1

Debt-Equity Ratio

Nonfinancial Corporate Sector

	NBER	FRB
1900	0.753	
1912	1.004	
1922	0.733	
1929	0.731	
1933	0.884	
1939	0.756	
1945	0.542	
1946	0.508	0.321
1950	0.473	0.305
1955	0.496	0.317
1958	0.506	0.328
1960		0.355
1965		0.418
1970		0.464
1975		0.378
1980		0.351
1985		0.468

Sources: NBER: Goldsmith, Lipsey and Mendelson, 1963, Tables I and Ia, ratio of line III-14 to line IV. FRB: *Balance Sheets for the U.S. Economy*, line 41.

Table 2

Standard Deviations of Stock Market Data

	entire sample	sub-samples			
	1872-1987	1872-1913	1872-1929	1914-1946	1947-1987
nominal stock return	18.1	15.3	16.3	24.0	15.2
excess stock return	18.7	15.8	16.9	24.2	16.3
real stock return	17.9	14.1	16.0	23.2	16.8
price-dividend ratio	5.8	4.3	4.5	4.7	6.6
real dividend growth	12.4	10.9	12.5	18.2	7.5
real dividend growth over four years[a]	6.2	5.3	6.6	9.2	4.2
real log dividends, detrended	19.8	14.7	19.3	26.3	17.2

[a]Four year growth rates expressed as annual rates. Sub-samples begin in 1875, 1917, and 1950 to allow for extra lags.

Table 3

Tests of Constant Variance

1872-1913 versus 1947-1987

	variance ratio[b]	$\chi^2(1)$[c]	probability[d]
nominal stock return	1.01	<0.01	0.96
excess stock return	0.94	0.07	0.79
real stock return	0.71	3.16	0.08
price-dividend ratio	0.42	13.89	<0.01
real dividend growth	2.09	2.29	0.13
real dividend growth over four years[a]	1.62	1.12	0.29
real log dividends, detrended	0.73	0.58	0.45

[a]See note a, Table 2.

[b]Ratio of variance for 1872-1913 to 1947-1987.

[c]Test statistic for hypothesis that variances are equal (see fn. 23).

[d]One minus the probability of rejecting the null hypothesis that the variances of the respective series are the same in 1872-1913 and 1947-1987.

Figure 1 Excess Stock Return

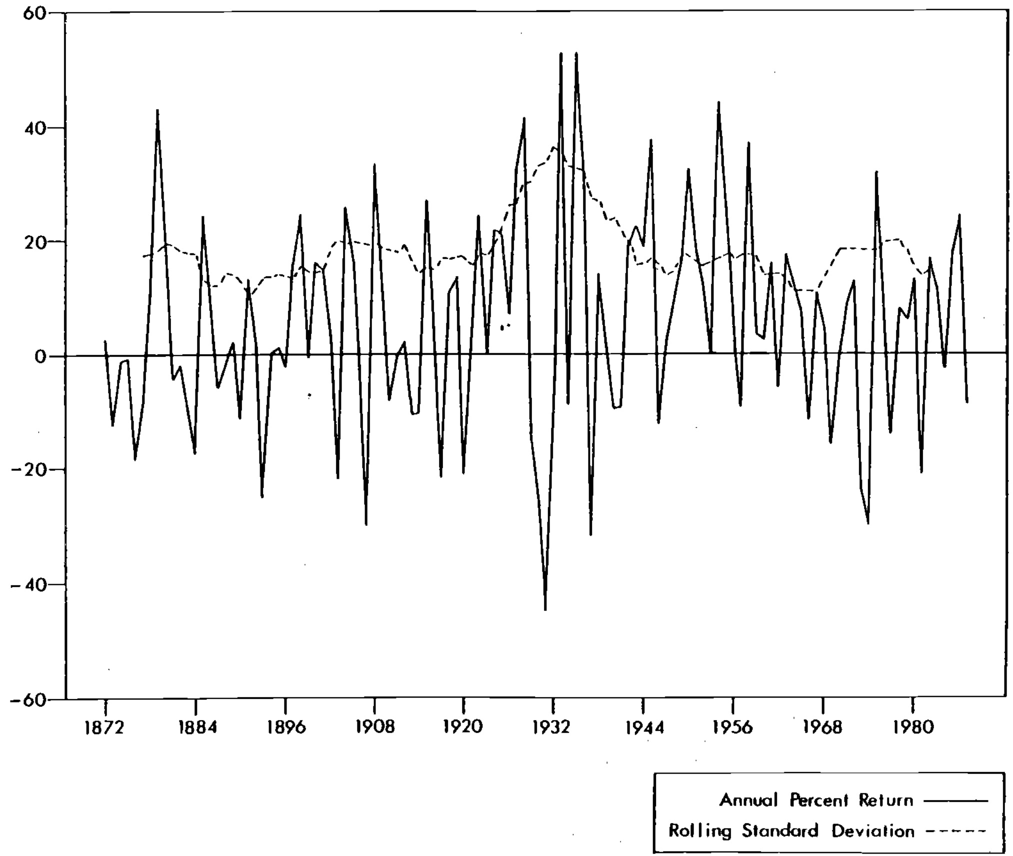


Figure 2 Real Stock Return

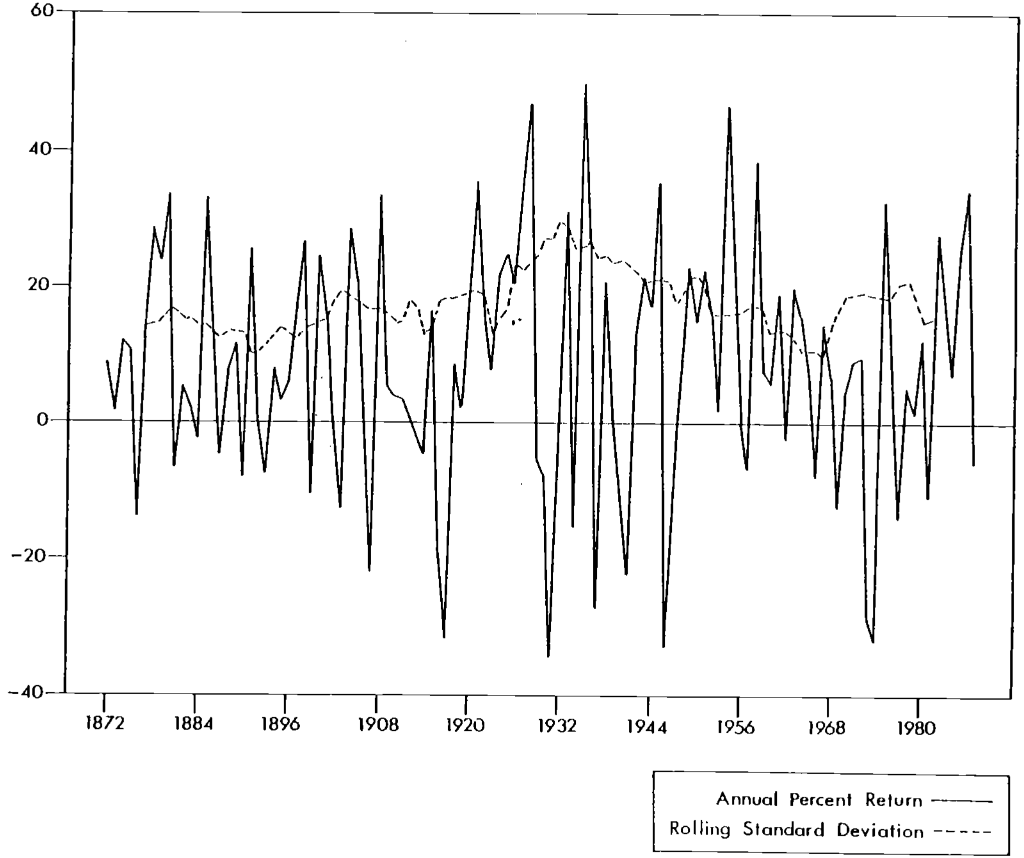


Figure 3 Price-Dividend Ratio

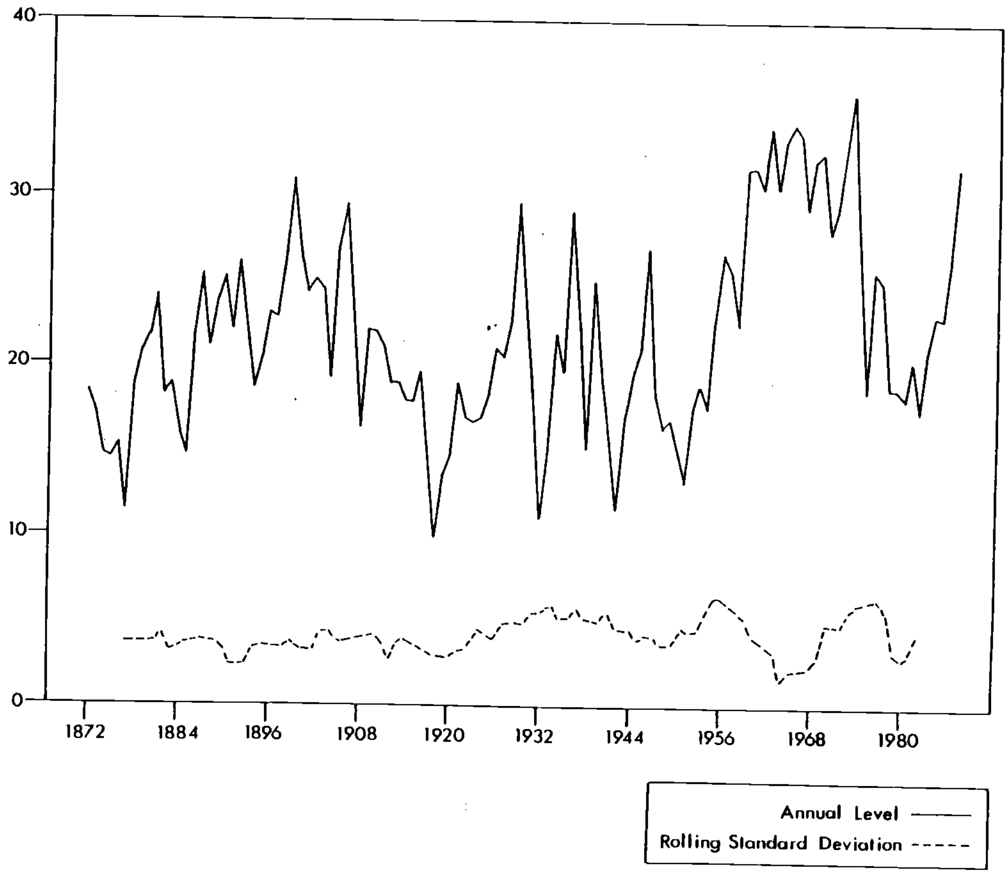


Figure 4 Real Dividend Growth

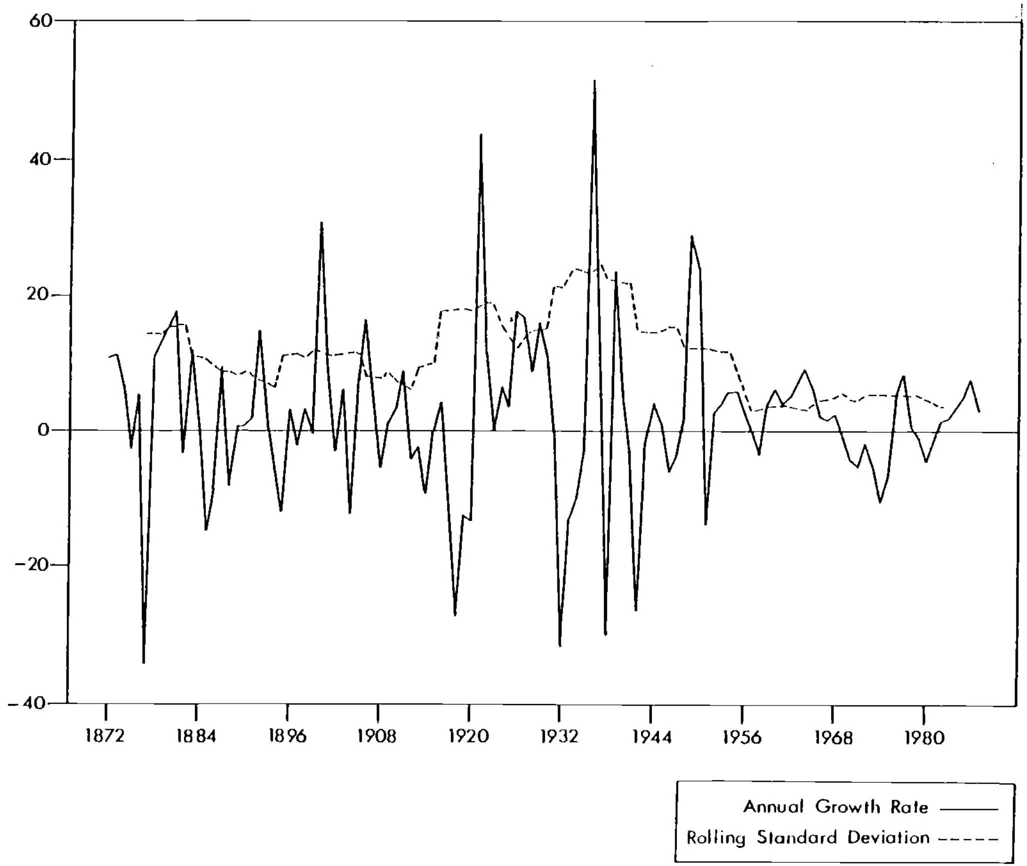
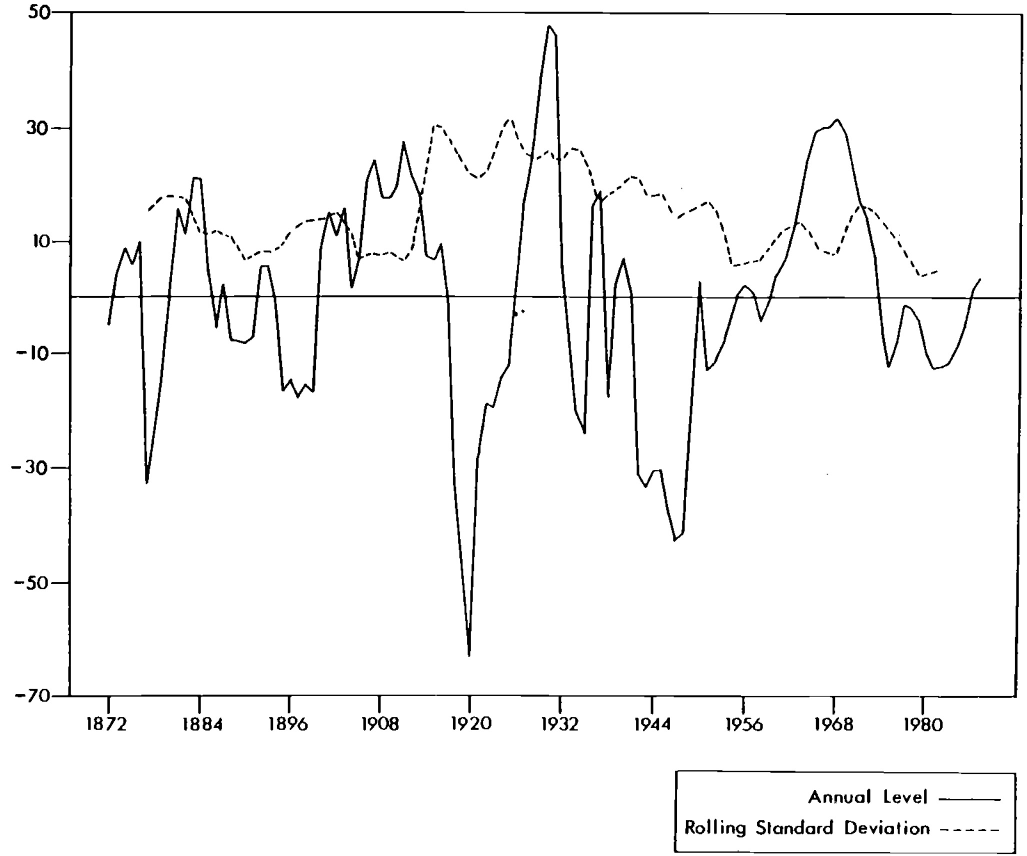


Figure 5 Real Log Dividends, Detrended



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