Federal Securities Regulations and Stock Market Returns

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Abstract

This paper examines the impact of federal securities statutes (seven major legislative acts and 535 amendments) on the mean and variance of total real U.S. stock market returns. In contrast to previous work, this study controls for the persistence of the variability of stock returns, employs a longer time period, utilizes a broader array of stocks and examines the impact of seven federal securities regulations and their selected amendments from 1933 through 2001. Despite the popular appeal of this legislation, our results indicate that these federal securities statutes and amendments have had no statistical impact on the mean or variance of total real stock returns over the past 70 years.

Federal Securities Regulations and Stock Market Returns

> "It is doubtful whether any other type of public regulation has been so widely admired as the regulation of the securities markets by the Securities and Exchange Commission. The purpose of this regulation is to increase the portion of truth in the world and to prevent or punish fraud, and who can defend ignorance or fraud?"[1]

I. Introduction

We have been building regulatory walls around U.S. financial markets for over a century. The first state securities regulations, called "blue sky" laws, were enacted nearly a hundred years ago and, over time, have been adopted, amended and extended by virtually all 50 states.[2] The first federal securities regulations were passed about seventy years ago in response to the perceived failure of blue sky laws to prevent the stock market crash of 1929 and the subsequent Great Depression.[3]

> "There has been an inflation (in stock prices) not free from the charge of criminality … It was inevitable that a day of reckoning would come and that billions would be lost as the water and hot air were eliminated from hundreds of issues."[4]

> "The breakdown of 1929 was a nearly the result of willful mismanagement and violation of every principle of sound finance as such occurrence has ever been. It was the outcome of vulgar grasping for gains at the expense of the community."[5]

In response to mounting political pressure generated by widespread public sentiment typified by the above comments, the U.S. Congress enacted six federal

[1] Stigler (1964a), p. 117.
[2] Sixteen states had imposed restrictions on "bucket shops" by 1908 and all states except Nevada had passed some form of blue sky legislation by 1933. In 1966, Stigler (1966, p. 48) noted that "... the states have had extensive and varied experiments with so-called blue sky laws long before the Securities and Exchange Act of 1934 and nobody really looked at the effects of the state laws to see if they yielded any useful results."
[3] Posner (1973, p. 198) suggests, however, this connection, while widely believed, is faulty: "Why have securities markets been singled out for unusually extensive regulation?" … [T]hey are associated with a misconception about the Depression. It is natural to think that the 1929 stock market crash must have been a cause of the Depression: *post hoc ergo propter hoc*. The theoretical basis for such an inference is unclear."
[4] King (1929).
[5] Willis (1930), p. 183

securities acts between 1933 and 1940: the Securities Act (1933) was quickly followed by the Securities Exchange Act (1934), the Public Utility Holding Company Act (1935), the Trust Indenture Act (1939), the Investment Company Act (1940) and the Investment Advisers Act (1940). Then, some thirty years later, in response to public concern over investor losses resulting from the bankruptcy of brokerage firms, Congress enacted the Securities Investor Protection Act (1970).

Yet, after a century of state securities laws and seventy years of federal securities statutes, the problems in securities markets appear to be unchanged and unchecked. Alleged fraudulent financial reporting and other criminal actions by corporate officers are so pervasive that the *Wall Street Journal* published its "Scandal Scorecard" to track the corporate players involved and uses its "Executives on Trial" columns to keep readers abreast of the latest court actions. Rohatyn recently described the causes of the current financial market problems in terms virtually identical to those used by market observers seventy years earlier:

> "These were the years of the stock market bubble and were followed by its collapse as well as by financial scandals. They all had the same characteristics: thousands of employees lost jobs and savings, stockholders lost capital, senior executives made fortunes, and many of those charged with protecting the interests of investors and employees failed in their duties. Speculation, encouraged by the financial media, had replaced investment—with disastrous results."[6]

And, once again, motivated by public concern arising from the latest bear market in stock prices and the recession in 2001, Congress passed the eighth federal securities statute, the Sarbanes-Oxley Act (2002).

Of course, these eight federal statutes are not the sum total of all federal efforts to regulate the securities markets. Over the past seven decades, Congress has passed over

[6] Rohatyn (2003).

500 amendments to these acts and current Congressional hearings hint of further federal securities regulations and amendments over the next few years. And, for the past 70 years, the Securities and Exchange Commission (hereafter called the SEC) has imposed numerous rulings, regulations and restrictions on the securities industry and, at present, it too is extending its regulatory walls even further.

What have these extensive federal securities regulations and amendments achieved? There have been several (albeit, surprisingly few) studies of this issue over the past seventy years. Stigler (1964a and 1964b), Benston (1969, 1973 and 1975), Jarrell (1981) and Simon (1989) used an event-study approach with different data sets and statistical models to examine the impact of the 1933-34 legislation on the mean and variability of selected stock returns. They concluded that this legislation had no statistically significant impact on the mean real returns for stocks and bonds. However, Stigler, Jarrell and Simon found that the variability of real stock returns had declined significantly following the enactment of this legislation.

When Officer (1973) and Schwert (1989) specifically examined the variability of general stock returns, they found that it was unusually high during the 1929-39 period when compared to either prior or subsequent periods. Consequently, they concluded that the lower variability in stock returns after 1939 was not due to federal securities legislation but, instead, was a return to normal levels that had prevailed prior to 1929.

This paper analyzes the impact of federal securities regulations on the mean and variance of stock market total real returns. We focus on the mean and variance of stock returns for several reasons. First, the previous studies have focused specifically on these measures. The event studies examined the impact of federal securities regulations on the

performance of the mean and variance of stock returns for a selected sample of stocks while Officer (1973) and Schwert (1989) used aggregate S&P 500 returns data. Second, the legislation refers (at least indirectly) to these measures as one rationale for the regulations.[7] Finally, the purpose of this legislation is universally acknowledged to be concerned with the protection of investor interests.

> "There are two basic aims of securities regulation, protection of investors and the broader public interest. ... The public interest in the area of securities regulation relates, of course, largely (though not entirely) to the impact of regulation on the economic performance of securities markets."[8]

While "protection of investors" and "economic performance of securities markets" may include a vast number of different measures, economic and finance theories suggest that chief among these are the risk and total real returns of investment opportunities available to investors.

We use a GARCH time-series model to estimate the impacts of the federal securities regulations.[9] This econometric approach is used widely in financial research for its three important characteristics: it estimates simultaneously the properties of the mean and variance of stock returns; it controls for the cyclical pattern in the variance of stock returns;[10] and, it measures the momentum or persistence in the variance of stock returns.[11] The previous event studies estimated the regulatory impact on the mean and

[7] For example, Section 2 of the Securities Exchange Act of 1934, entitled the "Necessity for Regulation as Provided in this Title," states that, "Frequently the prices of securities on such exchanges (NYSE, etc.) and markets are susceptible to manipulation and control, and the dissemination of such prices gives rise to excessive speculation resulting in sudden and unreasonable fluctuations in the prices of securities …." Obviously, these changes in the prices of securities are an important component of total returns and fluctuations in these prices contribute to the variance of returns.

[8] Friend (1969), p. 186.

[9] See Engle (1982) and Bollerslev (1986) for discussion of GARCH models.

[10] See Mandelbrot (1963), Fama (1965), Bollerslev (1986) and Diebold (1988) for discussion of the cyclical pattern in the variance of stock returns.

[11] See, for example, Engle and Bollerslev (1986), French, Schwert and Stanbaugh (1987), Bollerslev (1988), Lamoureux and Lastrapes (1990), Bollerslev and Engle (1993), Andersen and Bollerslev (1997) and Harrison (1998).

variance of stock returns separately. However, because the statistical analysis of the mean return depends on the properties of the variance of the stock returns, separate estimation of the mean equation in these studies may involve a biased statistical inference. Moreover, the previous event studies ignored the temporal dependence and persistence in the variance of stock returns. Unless this dependence is modeled explicitly, it would be misleading, at best, to interpret differences in the variance of returns observed at different times as the result of regulatory impacts on financial markets. Because shocks to the variance of stock returns do not decay or, alternatively, decay very slowly over time, it is even more difficult to associate changes in the variance with the passage of the federal securities regulations using the techniques applied in the previous work.[12] We use a GARCH model to avoid these problems.

The GARCH model also enables us to measure the impact of the federal securities regulations as a series of interrelated events. The previous event studies treated federal securities market regulations as a single event with a specific date to distinguish between before-and-after periods—typically pre-and-post 1933-34. These studies ignored the potential impacts of the federal statutes that were enacted after 1934 as well as the numerous amendments to these statutes over the past 70 years. We examine the evolving impact of federal securities legislation as it was enacted by including in our model seven of the eight Acts and nearly 600 amendments.

We apply the GARCH model to stock return data from 1871 through 2001. Previous event studies typically used stock returns from 1926-1933 for the pre-regulatory period and data after 1945 for the post-regulatory sample. The period between 1933 and

[12] Schwert (1989) notices the dependence of the variance in his study. However, he use sample standard deviation of daily returns to derive the measure the variance of the stock returns.

1945 are usually removed from the analysis to control for the Great Depression and WWII. However, as Officer (1973) and Schwert (1989) noted, stock return variability was unusually large during the 1929-39 period. Therefore, these studies should have chosen a sample period prior to 1929 or earlier for their pre-regulatory event period. We estimate our model using data back to 1871.

Our paper proceeds as follows. First, we review the results of previous work. We then present our estimation model and compare the results of our analysis to those of the previous studies. Finally, a summary of our analysis and results concludes the paper.

II. Review of Previous Studies

> "The basic test is simplicity itself: how did investors fare before and after the SEC was given control …."[13]

The first economic analysis of the impact of federal securities statutes did not appear until thirty years after the initial laws were passed. Manne attributes this gap to a variety of legal and informational impediments that imposed extremely high entry costs on economists who might have been interested in assessing the impact of this regulation.[14] Peltzman, on the other hand, argues that analytical framework for assessing the impact of government regulations was not developed until 1962.

> "The tendency of economists to accept without examination the effects of a wide range of government regulation was pervasive before 1962. This was changed permanently by the Stigler-Friedland paper [on the impact of regulation on electricity rates]. ... The impact of the Stigler-Friedland article on the profession owed as much to ... the methodological innovation of estimating the effect of regulation from an explicit statistical model."[15]

[13] Stigler (1964a), p.120
[14] Manne (1969), p. vii.
[15] Peltzman, (1993), pp. 819-20.

The approach developed in the Stigler-Friedland article generated a flood of studies that sought to analyze the impact of government regulations. A small number of these studies focused specifically on the impact of federal securities regulations on stock and bond returns.

In the first study of the impact of the federal securities regulations, Stigler (1964a, 1964b) compared the mean returns of new issues of stocks over one- to five-year periods prior to 1933 with those subsequent to 1933. He used new stock issues offered in 1923-1927 for the pre-SEC period and those offered in 1949-55 for the post-SEC period. Stigler found that the "... differences [in the mean returns] are not statistically significant in any year."[16] However, Stigler found that the "variances of the price relatives [were] larger in the earlier period than in the post-SEC period ..."[17]

Jarrell (1981) extended Stigler's earlier study by applying the capital asset pricing model to a much larger array of new stock and bond issues. However, Jarrell's conclusions are virtually identical to those reached 17 years earlier by Stigler. First, "the mandatory registration of new equity issues did not improve the net-of-market returns over five years to investors who purchased the issues."[18] Second, "SEC regulation has reduced the risk of the portfolio of new issues available for purchase by public investors. ... This finding of risk reduction was reported by Stigler also."[19]

Simon (1989) divided the new issues into seasoned and non-seasoned issues and examined the returns for 60 months following the issue date. Like Stigler and Jarrell, Simon concluded that there was no change, in general, in the mean rates of return for new

[16] Stigler (1964b), p. 418.
[17] Stigler (1964b), pp. 418-9.
[18] Jarrell (1981), p. 666
[19] Ibid, pp. 667-8

issues following the 1933 Act while the variance of new issue returns was statistically lower following the Act.

In a series of studies, Benston (1969, 1973 and 1975) investigated the impact of the disclosure requirements under the 1933 and 1934 Acts on stock returns. His 1969 article concluded that, although the accounting and income data that the legislation required firms to provide did not provide investors with useful information, the compliance costs to the firms, and, therefore, to their investors, was substantial. His 1973 and 1975 articles examined the differential impact on stock returns of firms that were affected by the SEC's disclosure requirements versus those that were not and concluded that the disclosure requirements had no measurable positive effects. The risk to investors, measured by the variance of stock prices net of covariance with the market, had not declined, nor had the relative percentage of large price movements been reduced.

Thus, while these studies all concluded that the 1933 and 1934 federal securities statutes had no statistically significant impact on the mean real stock returns, three of the four authors reported that the variability of stock returns had significantly declined following the enactment of these regulations.

Officer (1973) and Schwert (1989) were interested in discovering why the variability of stock market returns changes dramatically during certain periods. Unlike the previous articles cited, their studies are not designed explicitly to assess the impact of federal security regulations on stock price variability. However, their conclusions indicate clearly that the passage of the federal securities laws was not responsible for the decrease in stock price variability noted above.

Officer's (1973) study was concerned with the observed decline in the general variability of stock returns from 1926 to 1960—a decline that had been attributed by some analysts to the formation of and subsequent actions of the SEC. After simply viewing monthly stock price fluctuations from 1897 through 1968, Officer conjectured that stock market volatility was essentially the same in the 1897–1929 and 1940-1968 periods. However, it appeared to be unusually high during the Great Depression period (1930-1939)—part of which had been used as the pre-SEC period in the event studies cited above. Figure 1 shows the total real stock returns monthly from 1871 through 2001 that we use in this study. Although our data series differs from that used by Officer, it illustrates what he observed in his study: the variability of these returns prior to 1929 is similar to that after 1940 and the variability of these returns during the Great Depression is unusually large. After examining various factors that might have contributed to the "abnormal" increase in the variability of stock returns during the 1930 – 1940 period, Officer concluded that the

> "... apparent postwar decline in [stock] market-factor variability observed by other studies was shown to be more accurately described as a return to normal levels of variability after the abnormally high levels of the 1930s. This fact in itself casts serious doubts on any responsibility of the SEC for the lower levels of [stock price] variability postwar."[20]

Schwert (1981) agreed with Officer's conclusion. After summarizing Officer's findings, he states that "... in combination with Benston's results, there is no evidence that the initiation of SEC regulation had any significant impact on the variability of NYSE stock returns."[21] Schwert (1989) reinforces this conclusion by providing a

[20] Officer (1973), p. 452
[21] Schwert (1981), p. 151

comprehensive analysis of the relationship between stock and bond market volatility and the volatility of a number of important macroeconomic variables. He concludes that

> "... the evidence ... reinforces the argument made by Officer (1973) that the volatility of stock returns from 1929 to 1939 was unusually high compared with either prior or subsequent experience. For many years macroeconomists have puzzled about the inability of their models to explain the data from the Great Depression. The results in this paper pose a similar challenge to financial economists."[22]

The broad conclusions from the studies cited above are that federal securities legislation has had no impact on real stock returns or their variability. However, as we noted in our introduction, these conclusions may be premature for several reasons. These studies (1) assessed the impact of regulations on the mean and variance of stock returns with two separate estimations; (2) did not consider the cyclical pattern and persistence in the variance of stock returns; (3) ignored the evolving impact of federal securities legislation over the past seven decades; and, (4) used the unusual 1926-1933 period as the pre-regulatory reference period.

III. Estimation Model and Results

> "That laws matter is not difficult to say. ... It is more difficult to say which ones matter. Do they all matter? ... Do particular ones matter more than others? How can we identify them? ... How would we know?"[23]

Eight federal securities statutes, and over 500 amendments to them, have been enacted over the past 70 years. Have any federal statutes and/or their amendments had an impact on the securities markets? If so, which ones? The GARCH model we use enables

[22] Schwert (1989), p. 1146.
[23] Straszheim (2000), p. 216.

us to estimate the progression of the mean and variance of total real stock returns through time. As a result, we can examine the impact of the introduction of federal securities regulations on these measures.

Estimation Model

A simple GARCH model for estimating the conditional mean and variance in total real stock returns is:[24]

$$y_t = c_0 + a y_{t-1} + u_t \tag{1}$$

$$h_t = \alpha_0 + \beta_1 u_{t-1}^2 + \beta_2 h_{t-1}, \tag{2}$$

where y_t is the total real return and u_t is a random error such that $u_t = z_t h_t$ and z_t is the standard normal random variable.[25] Equation (1) estimates the conditional mean and Equation (2) estimates the conditional variance.[26] The persistence of shocks to the variance is measured by β_1 and β_2 in Equation (2). The closer the sum of β_1 and β_2 is to one, the greater is the persistence of these shocks. Equation (2) implies that the unconditional variance of total real stock returns is $\sigma^2 = \frac{\alpha_0}{1-\beta_1-\beta_2}$. We extend this simple GARCH model to examine the impact of federal securities regulations on the

[24] For an explanation of the simple GARCH model we use in this paper, see Bollerslev (1986). Extended GARCH models include the exponential GARCH (Nelson (1991)), the threshold GARCH (Glosten, Jaganthan, and Runkle (1993) and Zakoïan (1994)) and the Power ARCH (Ding, Granger, and Engle (1993)).

[25] Of course, the random error z_t could have some other probability distribution, for example a t-distribution.

[26] We include an AR(1) term in the mean equation to correct our estimates for first order serial correlation in returns produced by our use of the monthly average level of the index in the calculation of total returns.

mean and variance of monthly S&P 500 total real returns. A detailed description of our data in appears in the Data Appendix. Our sample period is 1871 through 2001.

To measure the impact of federal securities regulations on the mean and variance of total real stock returns, we use six dummy variables related to these regulations in the above equations:

D2629 = 1 for January 1926 – September 1929; = 0 otherwise.

D2933 = 1 for October 1929 – April 1933; = 0 otherwise.

D3335 = 1 for May 1933 – December 1935; = 0 otherwise.

D3640 = 1 for January 1936 – July 1940; = 0 otherwise.

D4001 = 1 for August 1940 – December 2001; = 0 otherwise.

D7101 = 1 for January 1971 – December 2001; = 0 otherwise

D2629 designates a nearly 3-year period immediately prior to the stock market crash in October 1929. We have included it in our model because some analysts have alleged that a stock market bubble emerged during this period that caused the stock market crash of 1929 when it burst.[27]

D2933 designates the period associated with the stock market crash and the Great Depression; it covers the period up to the passage of the Securities Act of 1933. D3335 and D3640 span the seven years during which Congress enacted the first six federal securities statutes and the Great Depression.[28] These two dummy variables are included to control for this period of rapidly evolving federal securities statutes. The 1933-40

[27] See, for example, White (1990) and Shiller (2001).
[28] The Securities Act of 1933 was passed in May 1933 while the Investment Company Act of 1940 and the Investment Advisers Act of 1940 were both passed in August 1940.

period is split into two parts to account for potential differences in the effects of the evolving legislation on stock returns in the first versus the second half of the period.

D4001 represents the period following the enactment of these six federal statutes. The last dummy variable, D7101, represents the period following the passage of the Securities Investor Protection Act (December 1970).[29] D4001 and D7101 are included in the estimates to measure the long-run impact of federal securities legislation on the mean and variance of stock market returns. Including these six dummy variables modifies the simple GARCH model as follows:

$$y_t = c_0 + ay_{t-1} + c_1 D2629_t + c_2 D2933_t + c_3 D3335_t + c_4 D3640_t + c_5 D4001_t + c_6 D7101_t + u_t \quad (3)$$

$$h_t = \alpha_o + \beta_1 u_{t-1}^2 + \beta_2 h_{t-1} + \alpha_1 D2629_t + \alpha_2 D2933_t + \alpha_3 D3335_t + \alpha_4 D3640_t + \alpha_5 D4001_t + \alpha_6 D7101_t . \quad (4)$$

The coefficients c_1 - c_6 and α_1 - α_6 measure the differences in the mean returns and variance of returns, respectively, across the designated periods compared to their values in the January 1871- December 1925 period. If these regulations have any effect on the mean returns or variance, one or more of these estimated coefficients will be significantly different from zero. In particular, if the federal securities statutes have benefited investors through increased mean total real stock returns and/or decreased variance of these returns, the estimates of c_5 and c_6 will be positive and/or α_5 and α_6 will be negative and statistically significant.

[29] We exclude the Sarbanes-Oxley Act (2002) from our analysis.

The GARCH model with the six dummy variables shown above treats the impact of these seven federal regulations as one-time events, with their own specific timing, of course. However, these federal statutes have been amended numerous times since May 1933. Table 1 shows the number of amendments to four of the seven Acts grouped in five-year intervals.[30] These four Acts were amended 535 times since May 1933. We examine the effects of these amendments on the mean and variance of total real stock returns by using a single dummy variable, AD, which assumes a value of one in the 69 months (8.37% of the 824 months in our sample) in which amendments were passed and zero otherwise. Because stock prices are forward looking, we include leads and lags of AD in our model.

With the inclusion of AD, the estimating equations for y_t and h_t are:

$$y_t = c_0 + ay_{t-1} + c_1 D2629_t + c_2 D2933_t + c_3 D3335_t + c_4 D3640_t + c_5 D4001_t + c_6 D7101_t + b_1 AD_{t+1} + b_2 AD_{t+2} + \ldots + d_1 AD_{t-1} + d_2 AD_{t-2} + \ldots + u_t \quad (5)$$

$$h_t = \alpha_0 + \beta_1 u_{t-1}^2 + \beta_2 h_{t-1} + \alpha_1 D2629_t + \alpha_2 D2933_t + \alpha_3 D3335_t + \alpha_4 D3640_t + \alpha_5 D4001_t + \alpha_6 D7101_t + \delta_1 AD_{t+1} + \delta_2 AD_{t+2} + \ldots + \gamma_1 AD_{t-1} + \gamma_2 AD_{t-2} + \cdots \quad (6)$$

If these amendments have any effect on the mean or variance of total real stock returns, one or more of the estimated coefficients $b_1, b_2, \ldots, d_1, d_2, \ldots$, $\delta_1, \delta_2, \ldots, \gamma_1, \gamma_2 \ldots$ will be significantly different from zero. And, once again, if these amendments to the federal

[30] The legislative history of the amendments to the Securities Act (1933), Securities Exchange Act (1934), Investment Company Act (1940) and Investment Advisers Act (1940 were obtained from the *Securities Lawyer's Deskbook*. The link is http://www.law.uc.edu/CCL/sldtoc.html. Amendment data for the other acts are not conveniently available and are not examined here. The vast majority of the amendments we examine concern the 1933 and 1934 Acts. We suspect that this result would hold if amendments to the other Acts were included in our study.

securities statutes have benefited investors through increased mean total real stock returns and/or decreased variance of these returns, one of more of the estimated $b_1, b_2, ..., d_1, d_2, ...,$ will be positive and/or $\delta_1, \delta_2, ..., \gamma_1, \gamma_2 ...$ will be negative and statistically significant.

Empirical Results

Our GARCH model estimates for the mean and variance equations are shown in Table 2. The first column contains the results for the January 1871 - December 1925 period that we use as the prior period for comparison purposes. Columns (2) – (5) display the results of the various models for the entire January 1871 - December 2001 period. The simple model estimates from Equations (1) and (2) are shown in columns (1) and (2); of course, these results contain no dummy variables. There are two important differences in these results. First, the estimated coefficient for the conditional mean of the total real returns, 7.65%, for the 1871-1925 period is lower than the 9.14% estimate for the entire 1871-2001 sample period. Second, the conditional variance estimates differ considerably between the two sample periods. The estimated persistence coefficients ($\hat{\beta}_1$ = 0.109 and $\hat{\beta}_2$ = 0.732) sum to 0.841 in the 1871-1925 period, while they sum to 0.956 for the 1871-2001 period. This result indicates that shocks to the variance of total real stock returns are more persistent over the entire sample period than they are in the earlier period. As a result, the unconditional variance of total real stock returns for the entire sample period ($\hat{\sigma}^2 = 2256$) is considerably higher than it is for the earlier period alone ($\hat{\sigma}^2 = 1491$).

These differences suggest that the simple GARCH model may be inappropriately specified in the 1926-2001 period—perhaps because it ignores the potential impact of

events leading up to and including the Great Depression and the advent of federal security statutes. The estimation results in column (3) include the six dummy variables to control specifically for these events. The estimated coefficient for D2629 (22.17) in the column (3) estimate of the mean equation is significantly positive, indicating that the mean return is considerably higher in the years immediately preceding the Great Crash than in any other period over the 1871-2001 period. The test statistics also indicate that, other than this unusual period, the mean returns in all other periods are no different than that in the 1871-1925 period.

The coefficients for D2933 and D3640 are positive and statistically significant in the variance equation. These dummy variables were included to control for the Great Depression (D2933) and the period during which major pieces of regulatory legislation were being debated and enacted (D3335 and D3640). The estimated coefficient for D2933 (4605), shows that the variance of total real stock returns during the Great Depression is unusually high—consistent with Officer's (1973) and Schwert's (1989) findings. Furthermore, the estimated coefficients for D3335 (193) and D3640 (724) are both positive, but only the D3640 estimate is statistically significant. These results suggest that the variance of total real stock returns in the seven years following the passage of the Securities Act of 1933 (during which five additional statutes and at least 38 amendments were passed) was either no different ($\alpha_3 = 0$) or significantly higher ($\alpha_4 > 0$) than it was during the 1871-1925 period.

None of the estimated coefficients for D4001 and D7101 in the mean and variance equations in the column (3) estimate are statistically significant. Thus, neither the mean nor variance of total real returns is different after 1940 or 1970 than it was in

the 1871-1925 period. These results indicate that none of the federal securities regulations have had an impact on the mean and variance of total real returns in the 1940-2001 period.

Notice that the estimates for $\hat{c}_0 = 7.63$, $\hat{\alpha}_0 = 248$, $\hat{\beta}_1 = 0.085$ and $\hat{\beta}_2 = 0.746$ are close to the corresponding estimates of 7.65, 237, 0.109 and 0.732 for the 1871-1925 period in column (1). Thus, once we control for the specific episodes associated with the stock market crash, the Great Depression and the initial legislative response to these events that occurred from 1926 through 1940, the estimated coefficients in the mean and variance equations are essentially no different for the 1941-2001 period than they are for the 1871-1925 period. This result is striking. Prior to 1926, U.S. securities markets were free of federal regulation, while, after 1933, federal securities regulation became increasingly extensive. Yet, the coefficients that describe the formation of the mean and variance of total real stock returns are virtually identical for the two periods.

Column (4) shows the results obtained when the model is reestimated after the insignificant dummy variables from the column (3) estimates are removed. While the estimated coefficients in column (4) are closely similar to their counterparts in column (3), its Schwartz Information Criteria (SIC) of 10.3362 is less than those for the column (2) and (3) model estimates. This result indicates that the column (4) specification is the preferable model.

The column (5) estimates in Table 2 are those from Equations (5) and (6) with the addition of the amendments dummy variable added to those used in the column (4) estimates. We estimated models with different leads and lags of AD and compared them

using SIC values. The model with the lowest SIC is shown in column (5).[31] None of the AD leads or lags were statistically significant in the mean equation. However, as column (5) indicates, the estimated coefficient on AD's 4th lead is positive and significant and that for AD's 5th lag is negative and significant in the variance equation.[32] Because the magnitudes of these coefficients are similar but have opposite signs (their standard errors overlap), the net long run effect of these amendments on the conditional variance of stock returns is zero. This is also true for the unconditional variance (compare σ^2 in the columns (1) and (5) estimates).

The columns (4) and (5) estimates show that federal securities regulations have had no impact on mean stock returns. These results are similar to those in the event-studies cited previously. The columns (4) and (5) estimates are also consistent with Schwert's (1981, 1989) and Officer's (1973) conclusions that the reduction in the variance of returns after 1940 was a return to the conditions that had prevailed prior to 1926, not a consequence of the federal securities legislation.[33] Our methodology controls for unusual shocks to the variance of returns as well as their persistence and we find that the legislation has had no long term effect on the variance of the process that describes it.

One notable result in Table 2 is the change in the measure of persistence $(\beta_1 + \beta_2)$. In the simple GARCH model estimate in column (2), this measure is 0.956 –

[31] We began the estimation with 8 leads and lags. We then reduced the number of leads and lags by checking the t-statistics and SIC values.

[32] In one specification, the estimated coefficients for the 4th lead was -9.9 with a standard error of 5.4 in the mean equation while the coefficient of the 4th lag was +11.4 with a standard error of 4.6 also in the mean equation. The coefficients are statistically equal in magnitude but opposite in sign suggesting the amendments have a temporary and offsetting effect on the mean return. This model produced a higher SIC than the model shown in column (5) and was rejected as a consequence.

[33] In addition, the column (3) results are broadly consistent with those of Harrison (1998). He concluded that, because the distributions of stock returns in the eighteenth and twentieth centuries are remarkably similar, "... the distribution of prices is not driven by information technology, regulatory oversight or the specialist—none of which existed in the eighteenth-century markets." (p. 76).

very close to 1.0 – which indicates that shocks to the variance of real returns are highly persistent. However, the persistence measure declines markedly in the subsequent estimates that control for the unusual 1926-1940 period; in particular, it falls to 0.806 in the column (5) estimates. Several previous studies that have used GARCH to model stock market returns have noted the high persistence of shocks to the variance of the stock return data.[34] Lamoureux and Lastrapes (1990) argue that the high persistence observed in GARCH estimates may be caused by the ignorance of the structural shifts in the unconditional variance of returns in the estimation process. Our results indicate that the actual measure of persistence is not as high as other studies have found once the unusual 1926-1940 period is properly controlled in the estimation.

Results Using Alternative Stock Return Measures

The GARCH estimates in Table 2 use total real stock returns, which include capital returns, dividend and other distributions. Consequently, our results are not precisely comparable to those in the previous studies cited because they used capital returns (either nominal or real) instead of total returns. To check the robustness of our modeling approach and conclusions, we estimate our model with both nominal and real capital returns. The results in the variance equation in Table 3 indicate the following: (1) the positive and significant coefficients are only observed for the 1929-1933 and 1936-1940 periods. (2) The estimated coefficient of AD's 4^{th} lead is positive and significant and that for AD's 5^{th} lag is negative and significant. The net effect of these amendments is statistically insignificant. (3) The estimated persistence in the variance of stock returns

[34] See, for example, Lamoureux and Lastrapes (1990), Poterba and Summers (1986) and Glosten, Jagannathan and Runkle (1993).

declines with our modeling approach. For nominal capital returns, the persistence measure declines from 0.953 in the column (2) estimates to 0.804 in the column (4) estimates. A similar decline in the measure of persistence, from 0.953 to 0.803, is shown in columns (6) and (8) for real capital returns.[35] These results are virtually identical to those in Table 2 with respect to the estimation in the variance equation. Thus, our conclusions on the impact of securities regulations on the variance of stock returns are invariant to the use of total real returns, nominal, or real capital returns.

There are, however, two discernible differences between the Tables 2 and 3 estimates for the mean equation. First, the estimated coefficient for D2933 is negative and significant for both nominal and real capital returns in Table 3, while it is negative but not statistically significant in the Table 2 estimates. The significant negative mean for capital returns and real capital returns is not surprising given that this period encompasses the Stock Market Crash of 1929 and the initial years of the Great Depression. The insignificant negative mean for the total returns in Table 2 indicates significantly higher dividend distributions in this period than the earlier period.

Second, the coefficient for D4001 is positive and significant for both nominal and real capital returns in the Table 3, while it is positive but statistically insignificant in the Table 2 estimates. An increase in the real capital returns (shown in Table 3) without a higher total real returns (shown in Table 2) during 1940-2001 implies a relative decline in dividend distributions after 1940 when compared to the earlier period (1871-1925). While we can only speculate about what caused the change in the dividend policy of firms after

[35] Previous studies that use the GARCH model to investigate persistence in the volatility of stock returns generally use nominal or real capital returns.

1940, the important result is that total real returns to investors were no different in the 1940-2001 period than they were in the 1871-1925 period (Table 2).

IV. Conclusions

> "Corporate scandals of recent years have clearly shown that the plethora of laws of the past century have not eliminated the less savory side of human behavior."[36]

The federal securities regulations are probably more widely admired than any other U. S. government regulations. As Stigler noted, their purpose is to protect investor interests by increasing the portion of truth in securities markets and punishing fraud. Who, indeed, can be opposed to that? Yet, as the comments by Rohatyn and Greenspan indicate, the problems facing investors today appear to be virtually identical to those faced prior to the October 1929 stock market crash and the subsequent Great Depression that gave rise to these regulations. What, if anything, have these regulations achieved over the past 70 years?

This study examines the impact of federal securities regulations on the mean and variance of stock market returns. It differs from previous research on the issue in several important ways. First, we use a time-series modeling approach (GARCH) that controls for cyclical behavior in the variance of stock return data. Second, most prior studies used an event-study approach with a single date to separate stock returns into before-and-after SEC periods. In contrast, we examine the evolving impact on stock market returns of the federal securities legislation enacted from 1933 through 2001. Finally, we have

[36] Greenspan (2004). Nor are new laws likely to do so. As Stigler observed forty years ago, "... one can always find some dishonest ... men in a group of 100,000; not all the angels in heaven have good posture." (1964a, p. 118)

broadened the analysis by examining the monthly time-series behavior of total real returns generated by the S&P 500 for the period 1871-2001.

Our results indicate that the federal securities regulations considered here (seven major legislative acts and 535 amendments) have had no statistically significant impact on the mean or variance of total real returns for stocks included in the S&P 500 index. After controlling for the large shocks to the stock return data that occurred during the 1926-1940 period, that encompassed the 1929 stock market decline and the Great Depression, we find that the conditional mean and variance of monthly total real stock returns were no different during 1940-2001 than during 1871-1925. Our analysis also indicates that there is a temporary increase in the conditional variance of total real stock returns four months prior to the passage of an amendment to the federal securities statutes followed by a subsequent temporary decline five months following its enactment. Because the two temporary effects are equal and offsetting, amendments to the federal securities statutes have no permanent impact on the variance of total real stock returns.

Although we find no statistically significant impact of federal securities regulation on the mean and variance of stock market total real returns, this legislation may have other important consequences for the securities markets and for general economic growth.[37] Because this regulation imposes substantial compliance and enforcement costs on financial market participants, firms and taxpayers, its popularity with Congress and the general public must lie elsewhere than with its effects on real investment returns and risk.

[37] For example, a number of studies in the field of New Comparative Economics have found important positive effects of U.S.-style securities regulations on economic growth and financial market development. See, for example, La Porta et al. (2002)

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Appendix: The Data

We utilized data on monthly stock prices, S_t, a price index, P_t, and dividends, D_t, to calculate the total real stock returns. We use the S&P 500 index level for S_t and the consumer price index for P_t. Both data series cover the sample period 1871-2001 and are obtained from Shiller.[38] Because there is no readily available monthly dividend series that spans the period 1871-2001, we derived the series from two sources. We used data from Cowles and Associates (1939) to extract a monthly dividend series for the period 1871-1938, which was spliced to the dividend series obtained from the CRSP Stock Index database for the period 1926-2001. We used the dividend series from CRSP during the overlapping period in our estimations. Dividends are extracted using the following expression:

$$D_t = (TR_t - R_t)S_{t-1}, \tag{1A}$$

where $R_t = (S_t - S_{t-1})/S_{t-1}$ is the capital return, and $TR_t = (S_t - S_{t-1} + D_t)/S_{t-1}$ is the total return in month t. Between 1871 and 1938, TR_t is the percentage change in the "series C" index in Cowles and Associates (1939, pp. 168 and 169). R_t is the percentage change in the "series P" index from the same source (pp. 66-67). The series C index is the index for the level of stock prices including reinvested dividends while series P is the index of the level of stock prices. Monthly dividends for the period 1926-2001 are

[38] See http://www.econ.yale.edu/~shiller. The monthly average for the S & P 500 in Shiller is a compilation of Cowles Commission data and that reported in the Standard and Poor's Statistical Service, *Security Price Index Record*, 2002, page 2. The CPI data in Shiller are spliced from two sources: the Bureau of Labor Statistics for data from 1918-2001 and Warren and Pearson's price index for the earlier period.

calculated similarly. In this instance the data are from CRSP where TR_t corresponds to the value-weighted index return including dividend distributions, R_t is the value-weighted index return excluding dividends and S_t is the monthly closing level of the index.

The above two dividend series overlap during 1926-1938.[39] Figure 2 plots the two series during this period. It is apparent that the two series correspond closely. In addition, regressing the CRSP series at time t on the Cowles series at time t and one lead at $t+1$ produces an R^2 of 0.83. The estimated slope coefficients sum to 1.2 which is within two standard errors of 1.0. Furthermore, Shiller reports annual dividends and the correlation between these and the 12 month sum of the dividend series we extract from the Cowles data is 0.97.

After deriving the dividend series, we calculated the total real returns, y_t, as:

$$y_t = \frac{S_t / P_t - S_{t-1} / P_{t-1} + D_t / P_t}{S_{t-1} / P_{t-1}}. \qquad (2A)$$

Calculation of the total real returns can usually be derived from the difference between the total nominal returns and inflation rates. However, there are two problems with using this difference for the total real returns in this specific case. First, the total nominal returns reported by CRSP are based on month-end prices while Cowles price data are monthly averages. The total nominal returns from these two data sources are not

[39] The dividend series extracted from the Cowles data is rescaled by multiplying each data point by 0.1262 to reflect the different base years used for Cowles data versus that of Shiller. The base period for the Cowles stock price index is July 1926 at which point the level of the index is 100. The level of the S&P 500 reported in Shiller for July 1926 is 12.62.

consistent. Second, numerically, the total real returns equation in (2A) is not equal to the difference between the total nominal returns and inflation rates;

$$y_t = \frac{S_t / P_t - S_{t-1} / P_{t-1} + D_t / P_t}{S_{t-1} / P_{t-1}} \neq \frac{S_t - S_{t-1} + D_t}{S_{t-1}} - \frac{P_t - P_{t-1}}{P_{t-1}}. \qquad (3A)$$

Table 1
Frequencies of Amendments

	Number of Amendments					Number of Months with Amendments				
	1933	1934	1940A	1940B	Total	1933	1934	1940A	1940B	Total
1933-1935	11	9	0	0	20	3	2	0	0	3
1936-1940	2	14	1	1	18	2	3	1	1	4
1941-1945	1	1	1	0	3	1	1	1	0	3
1946-1950	0	6	0	0	6	0	4	0	0	4
1951-1955	8	2	2	0	12	1	1	1	0	1
1956-1960	4	5	8	15	32	3	4	4	5	5
1961-1965	2	13	0	0	15	2	3	0	0	4
1966-1970	6	16	25	6	53	3	6	3	3	7
1971-1975	2	23	11	3	39	1	2	3	1	4
1976-1980	9	14	20	4	47	5	6	3	2	7
1981-1985	3	19	1	1	24	3	6	1	1	7
1986-1990	10	70	28	16	124	2	9	4	5	9
1991-1995	8	22	2	1	33	2	6	1	1	6
1996-2001	20	51	28	10	109	4	4	5	4	5
Total	86	265	127	57	535	32	57	27	23	69

Notes: The column 1933 is for the Securities Act of 1933; 1934 column is for the Securities Exchange Act of 1934; 1940A column is for the Investment of Company Act of 1940; 1940B column is for the Investment Advisers Act of 1940. There are a total of 824 months between May 1933 and December 2001.

Table 2
S&P 500 Total Real Returns

	1871-1925	1871-2001			
	(1)	(2)	(3)	(4)	(5)
Conditional Mean					
c_0	7.65[c]	9.14[c]	7.63[c]	8.72[c]	8.59[c]
	(1.95)	(1.37)	(1.93)	(1.35)	(1.33)
D2629			22.17[c]	20.99[c]	21.37[c]
			(7.33)	(7.21)	(7.15)
D2933			-43.79		
			(30.76)		
D3335			11.60		
			(14.95)		
D3640			-2.56		
			(12.95)		
D4001			3.15		
			(3.21)		
D7101			-2.10		
			(3.83)		
Conditional Variance					
α_0	237[b]	100[c]	248[c]	238[c]	291[c]
	(92.63)	(38.09)	(68.65)	(59.54)	(76.27)
β_1	0.109[c]	0.119[c]	0.085[c]	0.085[c]	0.081[c]
	(0.037)	(0.032)	(0.025)	(0.024)	(0.023)
β_2	0.732[c]	0.837[c]	0.746[c]	0.761[c]	0.725[c]
	(0.080)	(0.037)	(0.058)	(0.050)	(0.061)
D2629			-8.36		
			(78.39)		
D2933			4605[a]	4554[a]	5420[a]
			(2671)	(2482)	(2849)
D3335			193		
			(214)		
D3640			724[a]	656[a]	749[a]
			(417)	(383)	(415)
D4001			-2.16		
			(36.67)		
D7101			53.43		
			(50.19)		
AD(4)					687[c]
					(242)
AD(-5)					-520[c]
					(97)
Likelihood	-3301	-8092	-8055	-8059	-8028
SIC	10.1613	10.3649	10.3736	10.3362	10.3268
$\beta_1 + \beta_2$	0.841	0.956	0.831	0.846	0.806
σ^2	1491	2256	1464	1550	1503

Notes: The numbers in parentheses are Bollerslev-Wooldridge robust standard errors. The superscripts a, b, and c indicate that the estimated coefficient is statistically significant at the 10%, 5% and 1% level, respectively. The estimated coefficients for y_{t-1} range from 0.258 to 0.271 and all are significant at the 1% level.

Table 3
S&P 500 Nominal and Real Capital Returns

	Nominal Capital Returns				Real Capital Returns			
	1871-1925	1871-2001			1871-1925	1871-2001		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Conditional Mean								
c_0	2.54	5.51 [c]	2.68	2.29	1.99	3.83 [c]	1.92	1.65
	(1.93)	(1.37)	(1.82)	(1.81)	(1.94)	(1.38)	(1.94)	(1.93)
D2629			20.23 [c]	20.99 [c]			24.31 [c]	24.60 [c]
			(7.52)	(7.46)			(6.95)	(6.89)
D2933			-62.43 [b]	-61.32 [b]			-51.66 [a]	-50.69 [a]
			(29.25)	(28.84)			(29.64)	(29.07)
D3335								
D3640								
D4001			6.13 [b]	6.77 [c]			5.11 [c]	5.27 [c]
			(2.66)	(2.61)			(1.92)	(1.88)
Conditional Variance								
α_0	263 [b]	101 [b]	236 [c]	280 [c]	247 [b]	104 [b]	239 [c]	297 [c]
	(109)	(41)	(67)	(79)	(99)	(42)	(68)	(82)
β_1	0.151 [c]	0.117 [c]	0.091 [c]	0.086 [c]	0.106 [c]	0.114 [c]	0.086 [c]	0.083 [c]
	(0.044)	(0.034)	(0.024)	(0.024)	(0.037)	(0.036)	(0.025)	(0.024)
β_2	0.663 [c]	0.836 [c]	0.751 [c]	0.718 [c]	0.730 [c]	0.839 [c]	0.761 [c]	0.720 [c]
	(0.097)	(0.043)	(0.057)	(0.068)	(0.083)	(0.045)	(0.056)	(0.065)
D2629								
D2933			4102 [a]	4782 [a]			4030 [a]	4819 [a]
			(2298)	(2502)			(2319)	(2547)
D3335								
D3640			759 [a]	856 [a]			699 [a]	808 [a]
			(431)	(461)			(408)	(443)
AD(4)				754 [c]				716 [c]
				(260)				(265)
AD(-5)				-494 [c]				-513 [c]
				(96)				(104)
Likelihood	-3273	-8062	-8024	-7996	-3305	-8096	-8060	-8030
SIC	10.0747	10.3260	10.3020	10.2949	10.1707	10.3695	10.3474	10.3383
$\beta_1 + \beta_2$	0.814	0.953	0.842	0.804	0.836	0.953	0.847	0.803
σ^2	1409	2150	1497	1429	1503	2217	1560	1506

Notes: The numbers in parentheses are Bollerslev-Wooldridge robust standard errors. The superscripts a, b, and c indicate that the estimated coefficient is statistically significant at the 10%, 5% and 1% level, respectively. The estimated coefficients for y_{t-1} range from 0.257 to 0.314 and all are significant at the 1% level.

Figure 1
S&P 500 Total Real Returns

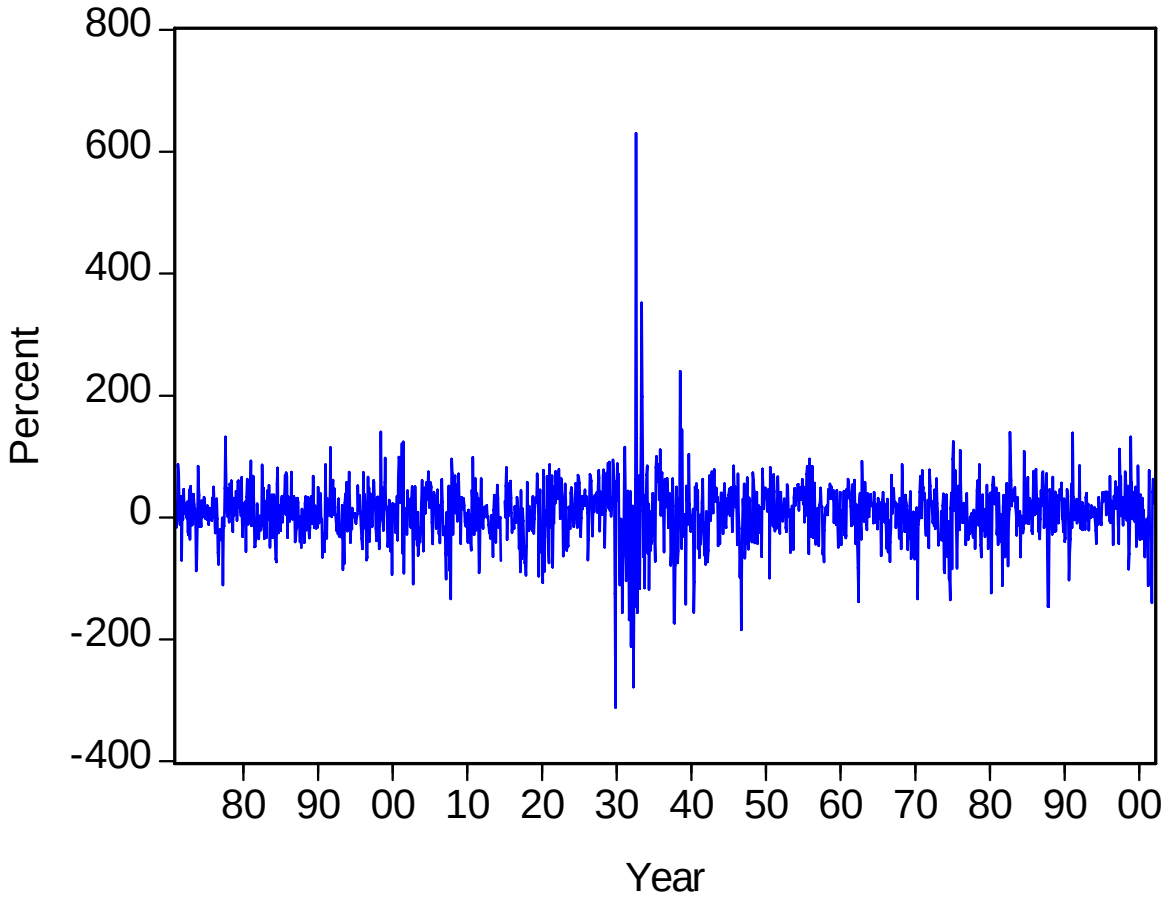

Figure 2
Monthly Dividends Extracted from CRSP vs. Cowles Data