

# **Federal Securities Regulations and Stock Market Returns**

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### *Abstract*

This paper uses the EGARCH-M model to examine the impact of federal securities statutes on the mean and variance of total real U.S. stock market returns. In contrast to previous work, this study employs a longer time period, utilizes a broader array of stocks and examines the impact of the eight major federal securities acts and their 573 amendments from 1933 through 2007. 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 75 years.

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**JEL classification:** C22, G38, K22

# Federal Securities Regulations and Stock Market Returns

## I. Introduction

“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?”<sup>1</sup>

We have been building regulatory walls around U.S. financial markets for over a century. State securities regulations, called “blue sky” laws, were initially enacted nearly a hundred years ago and, over time, have been adopted, amended and extended by virtually all 50 states.<sup>2</sup> The first federal securities regulations were passed about seventy-five years ago when, in response to the perceived failure of blue sky laws to prevent the stock market crash of 1929 and the subsequent Great Depression, the U.S. Congress enacted six federal securities acts between 1933 and 1940.<sup>3</sup> Passage of the Securities Act of 1933 was quickly followed by the Securities Exchange Act of 1934, the Public Utility Holding Company Act of 1935, the Trust Indenture Act of 1939, the Investment Company Act of 1940 and the Investment Advisers Act of 1940.

Thirty years later, in response to public concern over investor losses resulting from the bankruptcy of brokerage firms, Congress enacted the Securities Investor

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<sup>1</sup> Stigler (1964a), p. 117.

<sup>2</sup> 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.”

<sup>3</sup> 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.” Romano (2005, p. 1591) points out that the expansion in federal regulation of financial markets has typically followed significant turmoil in financial markets and real economic activity, with little or no economic rationale for the legislation.

Protection Act of 1970. Then, motivated by public concern arising from the bear market in stock prices and the recession in 2001, Congress passed the Sarbanes-Oxley Act of 2002, the eighth and most recent federal securities law.<sup>4</sup>

Additional federal legislation to regulate financial markets is pending at the present time. Congress is even considering extending regulatory powers to the Federal Reserve. A recent Wall Street Journal article argued that “...the old system—with a hands-off Fed and an SEC focused more on enforcement than prevention—had holes. ... [Policy] makers in Congress should recognize the need for prompt action ... .”<sup>5</sup>

Of course, the current eight federal statutes are not the sum total of all federal efforts to regulate the securities markets. Over the past seven and a half decades, Congress has passed almost 600 amendments to these acts. And, for the past 75 years, the Securities and Exchange Commission (hereafter called the SEC) has imposed additional numerous rulings, regulations and restrictions on the securities industry and, of course, continues to do so today.

What have these ever-growing federal securities regulations and amendments actually achieved since 1933? In this paper, we apply Nelson’s (1991) exponential GARCH-M (EGARCH-M) model to monthly data from 1871 through 2007 to estimate the impact of the federal securities regulations on stock market returns. We focus on the mean and variance of stock market returns for several reasons. First, previous studies have focused specifically on these measures. Second, the legislation refers (at least

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<sup>4</sup> For an extensive review of the Sarbanes-Oxley legislative history and a critique of the law itself, see Romano (2005).

<sup>5</sup> Currie and Beales (2008), p. C18.

indirectly) to these measures as one rationale for the regulations.<sup>6</sup> 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.”<sup>7</sup>

While “protection of investors” and “economic performance of securities markets” may include a vast number of different measures, both economic and financial theory suggests that chief among these are the total real returns of investment opportunities and their associated risks for investors.

## **II. Review of Selected Previous Studies**

The first economic analysis of the impact of federal securities statutes did not appear until thirty years after the initial laws were passed. With few exceptions, they utilized *event studies* that involved a comparison of the mean and variance of stock returns prior to and following passage of the securities regulations.<sup>8</sup> 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

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<sup>6</sup> 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.

<sup>7</sup> Friend (1969), p. 186.

<sup>8</sup> Romano notes that event studies are “widely used and well accepted in financial economics.” See footnote 57 in Romano (2005), pp. 1541-42 and Bhagat and Romano (2002).

“... differences [in the mean returns] are not statistically significant in any year.”<sup>9</sup>

However, Stigler found that the “variances of the price relatives [were] larger in the earlier period than in the post-SEC period ...”<sup>10</sup>

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.”<sup>11</sup> Second, “SEC regulation has reduced the risk of the portfolio of new issues available for purchase by public investors.”<sup>12</sup>

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

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, were substantial. His 1973 and 1975 articles examined the differential impact on stock returns of firms that were affected by the

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<sup>9</sup> Stigler (1964b), p. 418.

<sup>10</sup> Stigler (1964b), pp. 418-9.

<sup>11</sup> Jarrell (1981), p. 666

<sup>12</sup> Ibid, pp. 667-8

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.

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 2007 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.”<sup>13</sup>

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<sup>13</sup> Officer (1973), p. 452

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."<sup>14</sup> Schwert (1989) reinforces this conclusion by providing a 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."<sup>15</sup>

The above studies were the first to assess the impact of the federal securities regulations on stock returns. Of course, over the past two decades, there have been a host of additional studies that have generally yielded similar conclusions. For example, in their assessment of the Sarbanes-Oxley Act, Bhattacharya et al. (2002) found that it had had no impact on the stock returns for complying and non-complying firms. Similarly, in their study of the impact of SOX on merger premia among public targets and acquirers, Bertus et al. (2008) found that "Sarbanes-Oxley does not appear to have influenced the premia paid in corporate mergers."<sup>16</sup> They conclude that, given their evidence, at best it can be said that "... the Act did not impede the market for corporate control."<sup>17</sup>

Thus, previous studies of federal securities regulations have generally concluded that they have had essentially no effect on mean stock market returns. While some studies

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<sup>14</sup> Schwert (1981), p. 151

<sup>15</sup> Schwert (1989), p. 1146.

<sup>16</sup> Bertus et al., p. 44.

<sup>17</sup> Ibid

cited above did conclude that the passage of federal securities regulation had reduced the variability in stock returns, Officer (1973) and Schwert (1981, 1989) showed that this conclusion was spurious. It was based on the choice of the wrong period to represent the pre-regulatory behavior of stock returns.

Given these previous studies and their general conclusions, it might appear that yet another study of the impact of federal securities regulations on investment return and risk is either superfluous, if its conclusions are similar to those of the previous studies, or highly suspicious, if it reaches different conclusions from the studies that preceded it. However, both views are incorrect. Our approach is unique in four different and crucial ways from these studies.

First, the previous studies are, for the most part, event studies designed to examine the impact of, at most, one or two federal securities regulations over a relatively short period surrounding the passage of these statutes. Consequently, their conclusions are limited to the specific short-time time periods they analyze. In our study, we examine the impact of all eight federal securities statutes and about 600 amendments to them over their entire 75-year history.

Second, as we noted above, some previous studies had erroneously used the unusual 1926-1933 period as the pre-regulatory reference period for their event study analyses. In our study, we expand Officer's (1973) and Schwert's (1981, 1989) analyses by broadening the pre-regulatory reference period to encompass the years from 1871 to 1925—a 45 year period.

Third, previous studies, again, for the most part, examined the impact of these regulations on the mean and variability of returns for a selected subset of stocks. We

examine the impact of these regulations on the total real returns using a broad market measure of stock returns—the S&P 500 stock index.

Finally, previous studies typically estimated the regulatory impact on the mean and variance of stock returns separately and ignored the temporal dependence and persistence in the variance of stock returns. Because 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. In addition, unless the temporal dependence is modeled explicitly, it is misleading, at best, to interpret differences in the variance of returns observed at different times as resulting from 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.<sup>18</sup> Our model simultaneously estimates the properties of the mean and variance of stock returns, controls for the cyclical pattern in the variance of returns<sup>19</sup> and, measures the momentum or persistence in the variance of stock returns.<sup>20</sup>

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<sup>18</sup> Schwert (1989) notices the dependence of the variance in his study. However, he uses sample standard deviations of daily returns to derive the measure the variance of the stock returns.

<sup>19</sup> See Mandelbrot (1963), Fama (1965), Bollerslev (1986) and Diebold (1988) for discussion of the cyclical pattern in the variance of stock returns.

<sup>20</sup> 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).

### III. Estimation Model

The GARCH model is widely used to estimate the progression of the mean and variance of stock returns through time.<sup>21</sup> For several reasons discussed below, we use Nelson's (1991) extension of this model (EGARCH-M) to examine the impact of the introduction of federal securities regulations and their various amendments on total real stock market returns,  $y_t$ , in annualized percentage terms. The EGARCH-M model has the following form:

$$y_t = c_0 + ay_{t-1} + bh_t + u_t \quad (1)$$

$$\ln(h_t) = \alpha_0 + \beta \ln(h_{t-1}) + \gamma |z_{t-1} - E|z_{t-1}|| + \theta z_{t-1}, \quad (2)$$

where

$$y_t = \frac{S_t / P_t - S_{t-1} / P_{t-1} + D_t / P_t}{S_{t-1} / P_{t-1}} \times 1200 \quad (3)$$

and  $S_t$  is the S&P 500 stock index at time  $t$ ;  $P_t$  is the consumer price index at time  $t$ ;  $D_t$  is the dividend at time  $t$ . Monthly data for each of these variables for 1871-2007 are obtained from Shiller.<sup>22</sup> A plot of  $y_t$  is shown in Figure 1.

The estimating equation for the conditional mean of  $y_t$  is shown in equation (1)

where  $h_t$  is the conditional variance and  $u_t$  is a random error such that  $u_t = z_t \sqrt{h_t}$ .<sup>23</sup>

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<sup>21</sup> See Engle (1982) and Bollerslev (1986) for discussion of ARCH and GARCH models. For a survey of ARCH modeling in finance, see Bollerslev et al. (1992).

<sup>22</sup> Shiller, Robert J., <http://www.econ.yale.edu/~shiller/data.htm>.

Economic and financial theory of the relationship between risk and return implies that the coefficient of the conditional variance,  $b$ , in equation (1) is positive. Equation (2) estimates the conditional variance where  $\beta$  measures the persistence of past shocks to the variance and  $z_t$  is a random variable that has an i.i.d. generalized error distribution (GED) with mean zero, variance one, and tail thickness parameter  $\nu$ .

The specification in equation (2) has several advantages. In contrast to the traditional GARCH model, equation (2) is in logarithmic form. This restricts estimates of the conditional variance to non-negative values which, of course, is theoretically appealing. In addition, the  $\theta$  coefficient estimates the potential asymmetric effects of positive versus negative shocks to total returns on the conditional variance. Black (1976) speculates that a negative shock to total returns of some given magnitude will have a larger impact on the variance than a positive shock of the same magnitude. Our data series shown in Figure 1 obviously contains both very large positive and negative shocks to total returns. An estimate of  $\theta$  that is significantly less than zero is evidence consistent with Black's hypothesis. Finally, many have noted that the distribution of stock returns is characterized by fat tails. The specification of the GED distribution of the random error takes explicit account of this characteristic by providing an estimate,  $\nu$ , of its magnitude.

To measure the impact of federal securities regulations on the mean and variance of total real stock returns, we add seven event dummies to the EGARCH-M model as exogenous variables:

$$D2629 = 1 \text{ for January 1926 – September 1929; } = 0 \text{ otherwise.}$$

$$D2933 = 1 \text{ for October 1929 – April 1933; } = 0 \text{ otherwise.}$$

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<sup>23</sup> We include an AR(1) term in the mean equation to correct for first order serial correlation in returns produced by use of monthly averaged data in the calculation of total returns..

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

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

D4070 = 1 for August 1940 – December 1970; = 0 otherwise.

D7102 = 1 for January 1971 – July 2002; = 0 otherwise.

D0207 = 1 for August 2002 – December 2007; = 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 and that it caused the stock market crash of 1929 when it burst.<sup>24</sup>

D2933 designates the period associated with the stock market crash and the Great Depression 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.<sup>25</sup> These two dummy variables are included to control for this period of rapidly evolving federal securities statutes. The 1933-40 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 second half of that period.

D4070, D7102, D0207 represent different periods that followed the enactment of the initial federal statutes in 1933-40. The first dummy variable, D4070, represents the 30-year period between the enactment of initial legislation and the passage of the Securities Investor Protection Act in December 1970. D7102 represents the period following passage of the Securities Investor Protection Act and enactment of Sarbanes-

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<sup>24</sup> See, for example, White (1990) and Shiller (2001).

<sup>25</sup> The Securities Act of 1933 was passed in May 1933 while the Investment Company Act of 1940 and the Investment Advisors Act of 1940 were both passed in August 1940.

Oxley Act in July 2002. The last dummy variable, D0207, represents the period following enactment of the Sarbanes-Oxley Act. These dummy variables are used to measure the long-run impact of federal securities legislation on the mean and variance of stock market returns. Including all seven dummy variables, the EGARCH-M model is modified as follows:

$$y_t = c_0 + ay_{t-1} + bh_t + c_1D2629_t + c_2D2933_t + c_3D3335_t + c_4D3640_t + c_5D4070_t + c_6D7102_t + c_7D0207_t + u_t \quad (4)$$

$$\ln(h_t) = \alpha_0 + \beta_1 \ln(h_{t-1}) + \gamma |z_{t-1} - E|z_{t-1}|| + \theta z_{t-1} + \alpha_1 D2629_t + \alpha_2 D2933_t + \alpha_3 D3335_t + \alpha_4 D3640_t + \alpha_5 D4070_t + \alpha_6 D7102_t + \alpha_7 D0207_t. \quad (5)$$

Coefficients  $c_1, c_2, \dots, c_7$ , and  $\alpha_1, \alpha_2, \dots, \alpha_7$  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 securities regulations have an effect on 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 in the long-run, the estimates of  $c_5, c_6$ , and  $c_7$  will be positive and/or  $\alpha_5, \alpha_6$ , and  $\alpha_7$  will be negative and statistically significant.

The EGARCH-M model with the seven dummy variables shown above treats the impact of the eight 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 eight Acts grouped in five-year intervals.<sup>26</sup> These four Acts were amended 573 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 75 months (8.37% of the 896 months in the sample) in which amendments were passed and zero otherwise. Because stock prices are forward looking, we include leads as well as lags of AD in the model. Including AD, the estimating equations are:

$$\begin{aligned}
y_t = & c_0 + ay_{t-1} + bh_t + c_1D2629_t + c_2D2933_t + c_3D3335_t + c_4D3640_t \\
& + c_5D4070_t + c_6D7102_t + c_7D0207_t + d_1AD_{t+1} + d_2AD_{t+2} + \dots \\
& + e_1AD_{t-1} + e_2AD_{t-2} + \dots + u_t
\end{aligned} \tag{6}$$

$$\begin{aligned}
\ln(h_t) = & \alpha_o + \beta \ln(h_{t-1}) + \gamma |z_{t-1} - E|z_{t-1}|| + \theta_{z_{t-1}} + \alpha_1D2629_t + \alpha_2D2933_t \\
& + \alpha_3D3335_t + \alpha_4D3640_t + \alpha_5D4070_t + \alpha_6D7102_t + \alpha_7D0207_t \\
& + \delta_1AD_{t+1} + \delta_2AD_{t+2} + \dots + \lambda_1AD_{t-1} + \lambda_2AD_{t-2} + \dots
\end{aligned} \tag{7}$$

If these amendments have any effect on the mean or variance of total real stock returns, one or more of the estimated coefficients  $d_1, d_2, \dots, e_1, e_2, \dots, \delta_1, \delta_2, \dots, \lambda_1, \lambda_2, \dots$  will be significantly different from zero. And, once again, if these amendments to the federal securities statutes have benefited investors through increased mean total real stock returns

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<sup>26</sup> The legislative history of the amendments to the Securities Act of 1933, Securities Exchange Act of 1934, Investment Company Act of 1940 and Investment Advisers Act of 1940 were obtained from the *Securities Lawyer's Deskbook*. The link is <http://www.law.uc.edu/CCL/index.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.

and/or decreased variance of these returns, one or more of the estimated  $d_1, d_2, \dots, e_1, e_2, \dots$ , will be positive and/or  $\delta_1, \delta_2, \dots, \lambda_1, \lambda_2 \dots$  will be negative and statistically significant.

### III. Empirical Results

“The basic test is simplicity itself: how did investors fare before and after the SEC was given control ....”<sup>27</sup>

Our model estimates of the mean and variance equations for January 1871 – December 2007 are shown in Table 2. Column (1) shows the estimates for the simple EGARCH-M model without the sub-period dummy variables; column (2) shows the results for Equations (4) and (5) which include the seven dummy variables for the different sub-periods identified above. The estimated coefficients of the dummy variables measure the impact of events leading up to and including the Great Depression and the advent of federal security statutes. The estimated coefficient for D2629 (21.93) in the conditional mean equation is significantly positive, indicating that the mean return is considerably higher in the years immediately preceding the stock market crash of 1929 than in 1871-1925. The estimated coefficient for D2933 is -124.22 and is significantly negative reflecting the consequences of the crash. The test statistics also indicate that, following these two unusual periods, the mean returns in all sub-periods after 1933 were no different than in 1871-1925.

The coefficients for D2933 and D3640 in the conditional variance equation are positive and statistically significant. These dummy variables were included to control for

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<sup>27</sup> Stigler (1964a), p.120

the Great Depression (D2933) and the period during which major pieces of regulatory legislation were being debated and enacted (D3640). The estimated coefficient for D2933 (0.505), indicates 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 (0.164) and D3640 (0.223) 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 or significantly higher than it was during 1871-1925.

None of the estimated coefficients for D4070, D7102, and D0207 in the mean or variance equations in the column (2) estimates are statistically significant. Thus, neither the mean nor variance of total real returns is different after 1940, 1970, or 2002 than it was in the 1871-1925 period. This result provides striking evidence for the lack of any impact of securities regulations on real stock returns. Prior to 1926, U.S. securities markets were free of federal regulation, while, after 1933, federal securities regulation became increasingly extensive. However, 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 statistically no different for 1941-2007 than they are for the 1871-1925.

Column (3) shows the results obtained when the insignificant dummy variables from the column (2) estimates are removed. While the estimated coefficients in column (3) are close to their counterparts in column (2), its Schwartz Information Criteria (SIC)

of 10.3033 is less than those for either the column (1) or (2) estimates, suggesting that the column (3) specification is the preferable model. Note that the parameter for generalized error distribution ( $\nu$ ) is less than 2 in this and all other columns which is evidence of a thick tail distribution that others have found in this data.

The column (4) estimates in Table 2 are those from Equations (6) and (7) with the addition of the amendments dummy variable added to those used in the column (3) 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 (4). None of the specifications for the mean equation that included AD leads or lags were selected using this criterion.<sup>28</sup> However, column (4) indicates that the estimated coefficient of AD's 4<sup>th</sup> lead is positive and significant and that for AD's 5<sup>th</sup> lag is negative and significant in the variance equation. Because the magnitudes of these coefficients are similar but opposite in sign (their standard errors overlap), the net long run effect of these amendments on the conditional variance of stock returns is zero.

The column (3) and (4) estimates show that federal securities regulations have had no long-run impact on the mean or variance of stock returns, i.e., the mean and variance of stock returns are statistically no different for 1940-2007 than for 1871-1925. These results are similar to those in several of the event-studies cited previously. The columns (3) and (4) 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

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<sup>28</sup> We initially began the estimation with 6 leads and lags. We then reduced the number of leads and lags by checking the t-statistics and SIC values. The model with the smallest SIC was selected and Tables 2-5 show only the results for the selected models. In one specification of the mean equation, the estimated coefficients for the 3<sup>rd</sup> lead was -6.29 and the 4<sup>th</sup> lead was -8.34 while the coefficient of the 4<sup>th</sup> lag was 9.58 and the 5<sup>th</sup> lag was 9.53. The sum of the coefficients in the leads is statistically equal in magnitude but opposite in sign to the sum of the coefficients in the lags. This suggests the amendments have a temporary and offsetting effect on the mean return. This model produced a higher SIC than the model shown in column (4) and was rejected as a consequence.

conditions that had prevailed prior to 1926, not a consequence of the federal securities legislation. The results are also broadly consistent with those of Harrison (1998, p.76) who 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.” Unlike these previous studies, our methodology models the progression (evolution) of the mean and variance over time focusing on the response to shocks introduced by events associated with the 1929 market crash, the initial legislative response and subsequent string of amendments. We find that the legislation has had no long term effect on the mean and variance of total real stock returns or the process that describes them.

In addition, the model employed here produces several other empirical results of note. First, the coefficient of the conditional variance ( $b$ ) in the mean equation is positive and significant in columns (2)-(4). This result is consistent with the proposition that risk and expected return are positively related. Second, the estimate of  $\theta$  is significantly negative across all specifications of the conditional variance equation in all columns. This is evidence consistent with Black’s (1976) hypothesis that negative shocks to total returns have a larger impact on the variance than positive shocks of the same magnitude. Lastly, in the simple EGARCH-M model estimate shown in column (1),  $\beta$  is 0.941 – 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 1926-1940 period; in particular, it falls to 0.854 in the column (4) estimates. Several previous studies that have applied GARCH models to stock market

returns have noted the high persistence of shocks to the variance of the stock return data.<sup>29</sup> Lamoureux and Lastrapes (1990) argue that the high persistence observed in GARCH estimates may be caused by ignoring structural shifts in the unconditional variance of returns. Our results indicate a marked decline in the measure of persistence once we control for the events associated with the 1929 stock market crash and the initial legislative response to this episode.

The Table 2 estimates control for the positive relationship between risk and return, the asymmetry of negative versus positive shocks to total returns on the variance of returns, and changes in the persistence of shocks to the variance of returns. This control is important because each of the above affect the estimation of the behavior of stock return data so failure to control would confuse attempts to isolate the impact of regulatory changes on the mean and variance of the data.

Table 2 shows regression results for the whole period using dummy variables to isolate the relevant sub-periods. Alternatively, Table 3 shows the results obtained when the sub-periods are estimated separately based on the lowest SIC values. Columns (1) – (4) are the results obtained excluding the amendment dummies while columns (5) – (7) show the results obtained including the amendment dummies. Notice that the estimates for 1971-2007 in columns (4) and (7) are very close to those for 1871-1925 in column (1). All the columns (4) and (7) coefficients are within one standard error of the corresponding estimates in column (1). For 1940-2007 in column (3), the conditional mean is higher (9.22 vs. 6.87) and the variance is less persistent (0.740 vs. 0.877) than that for 1871–1925, but the differences are statistically insignificant. The principal

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<sup>29</sup> See, for example, Lamoureux and Lastrapes (1990), Poterba and Summers (1986) and Glosten, Jagannathan and Runkle (1993).

difference between the results for 1926–2007 in columns (2) and (5) and for 1871-1925 is that the coefficient of the conditional variance ( $b$ ) in the mean equation is significant in 1926–2007, but not in 1871-1925 or any other sub-period. Therefore, the coefficient of the conditional variance ( $b$ ) in the mean equation is not estimated in 1871-1925, 1940-2007, and 1971-2007.

The Table 3 results are consistent with those in Table 2. The mean and variance of stock returns are statistically identical in 1871-1925, 1940-2007, and 1971-2007.

The EGARCH-M estimates in Tables 2 and 3 are for total real stock returns, which include capital returns, dividends and other distributions. Consequently, our results are not precisely comparable to those in the previous studies cited which used capital returns (either real or nominal) instead of total returns. To check the robustness of our conclusions, we re-estimate the model for both real and nominal capital returns. These results, shown in Tables 4 and 5, respectively, are similar to those in Table 2. Notice: (i) the positive and significant coefficients for 1926-1929 and negative and significant coefficients for 1929-1933 in the conditional mean equation; (ii) the positive and significant coefficients are only observed for 1929-1933 and 1936-1940 in the conditional variance equation; (iii) the estimated coefficient of AD's 4<sup>th</sup> lead is positive and significant and that for AD's 5<sup>th</sup> lag is negative and significant in the conditional variance equation and the net effect of these amendment dummies is statistically no different than zero; (iv) the estimated persistence in the variance of stock returns declines with our modeling approach. For real capital returns, the persistence measure declines from 0.944 in the column (1) estimates to 0.854 in the column (4) estimates in Table 4. A

similar decline in the measure of persistence, from 0.948 to 0.841, is shown in columns (1) and (4) for nominal capital returns in Table 5.

The results for the conditional variance equation in Tables 4 and 5 are similar to those in Table 2. Thus, our conclusions regarding the impact of securities regulations on the variance of stock returns are invariant to the use of total real returns, real capital returns, or nominal capital returns. However, the estimation results for the conditional mean in Tables 4 and 5 differ from those in Table 2 in two respects. First, the estimated coefficient for D4070 in the conditional mean is positive and significant for column (2) in Table 4 and for columns (2) – (4) in Table 5, while it is positive but statistically insignificant in Table 2. An increase in the real and nominal capital returns (Tables 4 and 5) without a higher total real return (Table 2) during 1940-1970 implies a relative decline in dividend distributions between 1940 and 1970 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 1940, the important result is that properties of total real returns to investors were no different in the 1940-2007 period than they were in the 1871-1925 period (Table 2). Second, the coefficient for the variance ( $b$ ) in the mean equation is not significant for either the real or nominal capital returns estimations. Therefore, the conditional variance is not included in the mean equation in the Tables 4 and 5 estimates.

In this study, in focusing on the impact of the federal securities laws and amendments on *overall* total real stock returns (mean and variability), we have excluded other exogenous variables from our model that have been used in previous studies of financial market returns. Among these omitted variables are non-trading days, trading volume, changes in tax laws on dividends, the ratio of book to market values, degrees of

globalization and bank liberalization, trade policies, and different industrial structures.<sup>30</sup> If these omitted variables are uncorrelated with the dummy variables used in our model (and we have no compelling reason to suspect otherwise), their omission will not bias the estimates in our regression or the conclusions we draw from them about the impacts of federal security statutes and amendments on real total stock returns.

## V. Conclusions

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. Yet the problems facing investors today appear to be similar to those that gave rise to these regulations 75 years ago. The recent decline in stock prices (which, at the moment, amounts to roughly 50 percent) and the remarkable increase in price volatility have prompted numerous calls for greater regulatory oversight of these markets.<sup>31</sup> Others are concerned that additional regulation will impose costs that will accelerate “the migration of business from Wall Street to London, Hong Kong and, even, Dubai . . .” and that the U.S. “will no longer be the financial capital of the world.”<sup>32</sup>

This study examines the impact of federal securities regulations on the mean and variance of stock market real total returns. It differs from previous research of federal securities regulations in several important ways. First, we use a time-series modeling approach (EGARCH-M) that controls for cyclical behavior in the variance of stock return

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<sup>30</sup> See, for example, Harrison (1998), Fama and French (1992 and 1996), Nelson (1991), and Schwert (1989).

<sup>31</sup> For example, former Treasury Secretary Henry Paulson claimed that, “There is no way to stabilize the markets other than through government intervention.” In a similar vein, former SEC Chairman Christopher Cox called on Congress for statutory authority to plug a “regulatory hole that must be immediately addressed.” *Wall Street Journal*, “Rescue Plan Calls for Deeper Regulation” (Sept. 24, 2008).

<sup>32</sup> *Wall Street Journal*, “Spitzer and Sarbox Were Deregulation?” (Oct. 31, 2008).

data, the positive relationship between risk and return, the asymmetry of negative versus positive shocks to total returns on the variance of returns, and changes in the persistence of shocks to the variance of returns. 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 impact on stock market returns of the eight major pieces of legislation and 573 amendments to federal securities regulation enacted from 1933 through 2007. Finally, we have broadened the analysis by examining the monthly time-series behavior of total real returns generated by the S&P 500 for the period 1871-2007.

Our results indicate that the federal securities regulations considered here (the acts and the 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 encompassing 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 1940-2007 than during 1871-1925.

In her discussion of the Congressional passage of the Futures Trading Act of 1921, Romano comments that, “at the hearings, opponents of the legislation ... made plain the proponent’s fundamentally flawed understanding of the problem and its solution. ... But even had economic theory and econometric techniques been as sophisticated and widespread then as they are today, it would have been to little avail, given the political circumstances.”<sup>33</sup> Once again, political circumstances and financial market conditions may result in new federal securities legislation. If so, this time it will occur *despite* sophisticated econometric techniques and numerous empirical studies that

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<sup>33</sup> Romano (2005), p. 1591.

suggest that the passage of federal securities regulations and amendments over the past seventy-five years have failed to achieve their main goals for investors.

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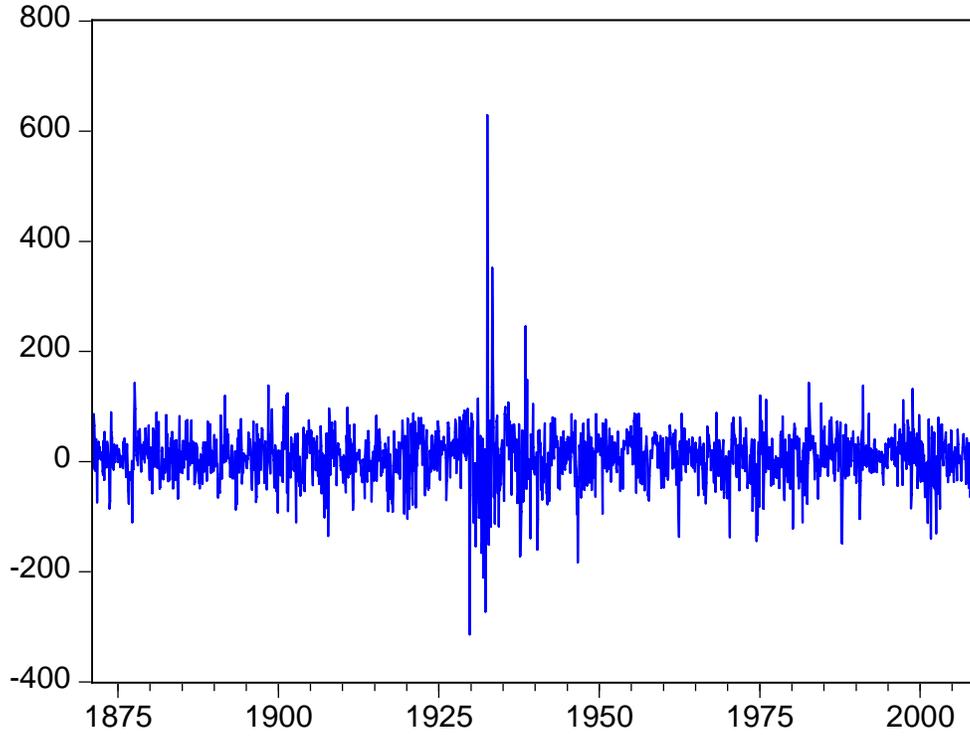
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Figure 1  
S&P 500 Monthly Total Real Returns  
1871 – 2007



*Note:* The returns are monthly percent changes in annualized rates.

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	2	19	1	1	23	2	6	1	1	7
1986-1990	10	71	28	16	125	2	9	4	5	9
1991-1995	7	23	2	1	33	2	6	1	1	6
1996-2000	20	51	28	11	110	4	4	5	4	5
2001-2007	5	28	2	2	37	3	6	2	1	6
Total	89	295	129	60	573	31	57	27	23	75

*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 896 months between May 1933 and December 2007.

Table 2  
S&P 500 Monthly Total Real Returns  
1871-2007

	(1)	(2)	(3)	(4)
	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)
<b>Conditional Mean</b>				
$c_0$	6.57 (1.88) <sup>c</sup>	1.88 (2.84)	4.79 (2.07) <sup>b</sup>	5.33 (1.94) <sup>c</sup>
$b$	0.00153 (0.00110)	0.00454 (0.0019) <sup>b</sup>	0.00290 (0.00136) <sup>b</sup>	0.00244 (0.00127) <sup>a</sup>
D2629		21.93 (8.61) <sup>b</sup>	23.27 (6.99) <sup>c</sup>	23.22 (7.08) <sup>c</sup>
D2933		-124.22 (33.57) <sup>c</sup>	-102.62 (26.08) <sup>c</sup>	-97.17 (25.84) <sup>c</sup>
D3335		-3.96 (17.82)		
D3640		-21.45 (14.31)		
D4070		5.22 (3.26)		
D7102		-0.46 (3.42)		
D0207		3.93 (5.72)		
AR(1)	0.266	0.284	0.272	0.266
<b>Conditional Variance</b>				
$\alpha_0$	0.270 (0.095) <sup>c</sup>	1.234 (0.290) <sup>c</sup>	0.884 (0.194) <sup>c</sup>	0.935 (0.187) <sup>c</sup>
$\gamma$	0.219 (0.027) <sup>c</sup>	0.163 (0.035) <sup>c</sup>	0.166 (0.033) <sup>c</sup>	0.168 (0.035) <sup>c</sup>
$\theta$	-0.084 (0.019) <sup>c</sup>	-0.135 (0.027) <sup>c</sup>	-0.116 (0.023) <sup>c</sup>	-0.108 (0.024) <sup>c</sup>
$\beta$	0.941 (0.013) <sup>c</sup>	0.812 (0.040) <sup>c</sup>	0.861 (0.026) <sup>c</sup>	0.854 (0.026) <sup>c</sup>
D2629		0.034 (0.066)		
D2933		0.505 (0.110) <sup>c</sup>	0.406 (0.078) <sup>c</sup>	0.431 (0.077) <sup>c</sup>
D3335		0.164 (0.105)		
D3640		0.223 (0.064) <sup>c</sup>	0.146 (0.042) <sup>c</sup>	0.162 (0.045) <sup>c</sup>
D4070		-0.014 (0.026)		
D7102		0.023 (0.026)		
D0207		-0.076 (0.064)		
AD(4)				0.327 (0.108) <sup>c</sup>
AD(-5)				-0.304 (0.127) <sup>c</sup>
GED ( $\nu$ )	1.45 (0.07) <sup>c</sup>	1.58 (0.08) <sup>c</sup>	1.58 (0.08) <sup>c</sup>	1.62 (0.08) <sup>c</sup>
Likelihood	-8444	-8408	-8414	-8391
SIC	10.3218	10.3407	10.3033	10.3029

*Notes:* The numbers in parentheses are standard errors. The superscripts a, b, and c indicate that the estimated coefficient is statistically significant at the 10%, 5% and 1% level, respectively.

Table 3  
S&P 500 Monthly Total Real Returns  
Subsamples Estimates

	1871-1925	1926-2007	1940-2007	1971-2007	1926-2007	1940-2007	1971-2007
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Conditional Mean</b>							
$c_0$	6.87 <sup>c</sup> (1.94)	6.23 <sup>c</sup> (2.39)	9.22 <sup>c</sup> (1.83)	7.38 <sup>c</sup> (2.32)	6.96 <sup>c</sup> (2.21)	9.41 <sup>c</sup> (1.82)	7.21 <sup>c</sup> (2.28)
$b$		0.0030 <sup>b</sup> (0.0015)			0.0023 <sup>a</sup> (0.0014)		
D2629		21.86 <sup>c</sup> (7.19)			22.72 <sup>c</sup> (7.51)		
D2933		-111.90 <sup>c</sup> (29.54)			-104.53 <sup>c</sup> (29.22)		
<b>Conditional Variance</b>							
$\alpha_0$	0.737 (0.482)	1.171 <sup>c</sup> (0.261)	1.820 <sup>c</sup> (0.483)	0.738 (0.376)	1.250 <sup>c</sup> (0.247)	1.979 <sup>c</sup> (0.454)	0.984 <sup>b</sup> (0.398)
$\gamma$	0.199 <sup>c</sup> (0.063)	0.137 <sup>c</sup> (0.050)	0.091 (0.062)	0.162 <sup>c</sup> (0.069)	0.127 <sup>b</sup> (0.054)	0.085 (0.066)	0.149 <sup>b</sup> (0.076)
$\theta$	-0.084 <sup>b</sup> (0.037)	-0.162 <sup>c</sup> (0.035)	-0.240 <sup>c</sup> (0.051)	-0.167 <sup>b</sup> (0.056)	-0.152 <sup>c</sup> (0.036)	-0.224 <sup>c</sup> (0.050)	-0.164 <sup>c</sup> (0.058)
$\beta$	0.877 <sup>c</sup> (0.070)	0.826 <sup>c</sup> (0.035)	0.740 <sup>c</sup> (0.065)	0.882 <sup>c</sup> (0.050)	0.816 <sup>c</sup> (0.033)	0.719 <sup>c</sup> (0.061)	0.851 <sup>c</sup> (0.053)
D2933		0.500 <sup>c</sup> (0.102)			0.533 <sup>c</sup> (0.100)		
D3640		0.165 <sup>c</sup> (0.052)			0.188 <sup>c</sup> (0.055)		
AD(4)					0.308 <sup>b</sup> (0.127)	0.331 <sup>b</sup> (0.136)	0.234 <sup>a</sup> (0.141)
AD(-5)					-0.330 <sup>b</sup> (0.153)	-0.342 <sup>b</sup> (0.174)	-0.336 <sup>b</sup> (0.171)
GED ( $\nu$ )	1.73 (0.15)	1.51 (0.10)	1.62 (0.11)	1.55 (0.15)	1.58 (0.11)	1.69 (0.12)	1.66 (0.17)
Likelihood	-3323	-5088	-4098	-2256	-5082	-4092	-2253
SIC	10.1696	10.4261	10.1879	10.2600	10.4274	10.1900	10.2706

*Notes:* The numbers in parentheses are standard errors. The superscripts a, b, and c indicate that the estimated coefficient is statistically significant at the 10%, 5% and 1% level, respectively.

Table 4  
S&P 500 Monthly Real Capital Returns  
1871-2007

	(1)	(2)	(3)	(4)
	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)
<b>Conditional Mean</b>				
$c_0$	4.12 (1.25) <sup>c</sup>	1.64 (1.91)	3.86 (1.29) <sup>c</sup>	3.81 (1.28) <sup>c</sup>
D2629		23.92 (8.28) <sup>c</sup>	23.20 (7.26) <sup>c</sup>	23.06 (7.31) <sup>c</sup>
D2933		-52.40 (20.02) <sup>c</sup>	-55.73 (18.34) <sup>c</sup>	-55.80 (18.74) <sup>c</sup>
D3335		13.49 (14.30)		
D3640		-2.75 (12.34)		
D4070		6.25 (3.22) <sup>a</sup>		
D7102		2.33 (3.23)		
D0207		3.73 (5.79)		
AR(1)	0.264	0.258	0.261	0.258
<b>Conditional Variance</b>				
$\alpha_0$	0.251 (0.087) <sup>c</sup>	1.003 (0.254) <sup>c</sup>	0.821 (0.183) <sup>c</sup>	0.940 (0.182) <sup>c</sup>
$\gamma$	0.218 (0.026) <sup>c</sup>	0.156 (0.033) <sup>c</sup>	0.160 (0.032) <sup>c</sup>	0.162 (0.034) <sup>c</sup>
$\theta$	-0.085 (0.019) <sup>c</sup>	-0.129 (0.026) <sup>c</sup>	-0.115 (0.023) <sup>c</sup>	-0.110 (0.024) <sup>c</sup>
$\beta$	0.944 (0.012) <sup>c</sup>	0.846 (0.035) <sup>c</sup>	0.871 (0.025) <sup>c</sup>	0.854 (0.025) <sup>c</sup>
D2629		0.033 (0.061)		
D2933		0.447 (0.105) <sup>c</sup>	0.389 (0.077) <sup>c</sup>	0.432 (0.079) <sup>c</sup>
D3335		0.108 (0.092)		
D3640		0.199 (0.060) <sup>c</sup>	0.168 (0.046) <sup>c</sup>	0.186 (0.049) <sup>c</sup>
D4070		-0.015 (0.024)		
D7102		0.019 (0.023)		
D0207		-0.050 (0.055)		
AD(4)				0.340 (0.109) <sup>c</sup>
AD(-5)				-0.320 (0.126) <sup>b</sup>
GED ( $\nu$ )	1.45 (0.07) <sup>c</sup>	1.57 (0.08) <sup>c</sup>	1.58 (0.08) <sup>c</sup>	1.61 (0.08) <sup>c</sup>
Likelihood	-8444	-8417	-8422	-8399
SIC	10.3218	10.3408	10.3021	10.3013

*Notes:* The numbers in parentheses are standard errors. The superscripts a, b, and c indicate that the estimated coefficient is statistically significant at the 10%, 5% and 1% level, respectively.

Table 5  
S&P 500 Monthly Nominal Capital Returns  
1871-2007

	(1)	(2)	(3)	(4)
	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)	Coefficient (S.E.)
<b>Conditional Mean</b>				
$c_0$	5.92 (1.24) <sup>c</sup>	1.82 (1.84)	4.56 (1.43) <sup>c</sup>	4.45 (1.43) <sup>c</sup>
D2629		22.32 (8.86) <sup>b</sup>	22.03 (7.36) <sup>c</sup>	22.06 (7.28) <sup>c</sup>
D2933		-60.26 (21.03) <sup>c</sup>	-62.49 (18.96) <sup>c</sup>	-63.17 (19.44) <sup>c</sup>
D3335		15.02 (14.49)		
D3640		-3.29 (12.91)		
D4070		8.84 (3.14) <sup>c</sup>	5.76 (3.02) <sup>a</sup>	6.03 (3.03) <sup>b</sup>
D7102		6.28 (3.18) <sup>b</sup>		
D0207		7.62 (5.79)		
AR(1)	0.282	0.268	0.273	0.269
<b>Conditional Variance</b>				
$\alpha_0$	0.222 (0.079) <sup>c</sup>	1.096 (0.273) <sup>c</sup>	0.872 (0.197) <sup>c</sup>	1.007 (0.193) <sup>c</sup>
$\gamma$	0.218 (0.028) <sup>c</sup>	0.175 (0.038) <sup>c</sup>	0.181 (0.037) <sup>c</sup>	0.186 (0.039) <sup>c</sup>
$\theta$	-0.082 (0.019) <sup>c</sup>	-0.130 (0.027) <sup>c</sup>	-0.112 (0.024) <sup>c</sup>	-0.107 (0.026) <sup>c</sup>
$\beta$	0.948 (0.011) <sup>c</sup>	0.829 (0.039) <sup>c</sup>	0.861 (0.028) <sup>c</sup>	0.841 (0.027) <sup>c</sup>
D2629		0.060 (0.061)		
D2933		0.504 (0.119) <sup>c</sup>	0.419 (0.086) <sup>c</sup>	0.473 (0.087) <sup>c</sup>
D3335		0.151 (0.100)		
D3640		0.239 (0.070) <sup>c</sup>	0.190 (0.053) <sup>c</sup>	0.214 (0.055) <sup>c</sup>
D4070		-0.004 (0.026)		
D7102		0.032 (0.027)		
D0207		-0.059 (0.060)		
AD(4)				0.390 (0.116) <sup>c</sup>
AD(-5)				-0.317 (0.138) <sup>b</sup>
GED ( $\nu$ )	1.45 (0.06) <sup>c</sup>	1.57 (0.08) <sup>c</sup>	1.55 (0.08) <sup>c</sup>	1.59 (0.08) <sup>c</sup>
Likelihood	-8419	-8382	-8390	-8368
SIC	10.2803	10.2982	10.2675	10.2690

Notes: The numbers in parentheses are standard errors. The superscripts a, b, and c indicate that the estimated coefficient is statistically significant at the 10%, 5% and 1% level, respectively.