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Stock Margins and the Conditional Probability of Price Reversals

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The paper has benefitted from conversations with Ramon DeGennaro and Steve Strongin. The conclusions of this paper are those of the authors and not necessarily those of the Federal Reserve Bank of Chicago or the Federal Reserve Board of Governors.

Stock Margins and the Conditional Probability of Price Reversals

Abstract

Levels of required margin are shown to be positively related to autocorrelations in stock returns, a result which implies that the probability of nontrading increases when margin levels increase. Frequencies of stock-price reversals are studied to determine the effect of margin requirements on participation by information traders. If price reversals are negatively (positively) related to high levels of margin, then relative proportions of information traders increase (decrease). We find that reversals occur more frequently prior to the regulation of margin in 1934. This date coincides with a general increase in the level of margins. Our logit specifications indicate that reversal probabilities are conditional on the level of margin. Controls for the effects of time and the introduction of regulation do not alter this conclusion. The results suggest that margin costs reduce stock market participation with a lesser effect on information-based trading.

I. Introduction

Niederhoffer and Osborne (1966) find that stock price reversals occur two or three times more often than do continuations. Fama (1970) suggests these reversals are induced by the presence of limit orders. More recently researchers are considering the possibility that these reversals are indications of previous over reaction. For example, Summers (1986) suggests that presence of a fad component in the determination of stock prices implies stock price reversals as fads dissipate. To mitigate the influence such fads may have on stock price volatility, Summers and Summers (1989) suggest introducing frictions such as transactions taxes. Such frictions raise trading costs reducing the benefits derived from participating in fads. Stock margins depend on a similar mechanism, raising trading costs for levered strategies to diminish the impact of these trades. Thus, the usefulness of the transaction tax proposal can be assessed by examining the impact of stock margins on fad trading. To this end, we use a logit specification to investigate the relevance of stock margins on the probability of encountering stock price reversals

Previous research examines the relation between stock-return volatility and margin requirements for equity positions.[1] Hsieh and Miller (1990) demonstrate that interpreting this evidence is necessarily dependent on the specification presumed for the evolution of volatility. Absent a model for the evolution of volatility, questions about the effect of margin levels on volatility appear unanswerable. Our approach re-frames the issue by focusing entirely on reversals. Thus, our paper does not address whether stock margins control volatility, we ask whether stock margins control over reactions associated with fad-motivated transactions.

Our empirical analysis begins by considering whether trading activity is affected by levels of margin. Autocorrelations of our stock index returns are shown to be positively related to levels of margin. Lo and MacKinlay (1990) show that these autocorrelations can be interpreted as nontrading probabilities. As increased nontrading probabilities are suggestive of decreased trading activity, we conclude that increased levels of margin do appear to decrease average trading activity.

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[1] See Chance (1990) and France (1991) for reviews of this literature.

We next examine return reversals to determine whether information traders are more responsive to changes in the cost of maintaining margin deposits. Several approaches are employed to answer this question. The answers obtained from these procedures are consistent. Frequency graphs of price reversals demonstrate that the percentage of reversals is negatively related to margin levels. Consistent with these graphs, mean times between reversals are also negatively related to margin levels. Finally, our logit specifications concur that reversal probabilities are negatively related to margin levels. We conclude that the evidence consistently rejects the null of no association between margin levels and stock price reversals.

The robustness of these logit specifications is also examined. We augment the specification with controls for SEC regulation and for temporal changes in the information-processing capacity of the stock market. Controls for monday effects on expected returns are also examined. Introduction of these controls does not alter our primary conclusion that the probability of price reversals is negatively related to the level of margin.

Section II introduces the stock return data used in this paper and estimates nontrading probabilities for various levels of required margin. Section III introduces our measure of price reversals. Our logit specification is developed in Section IV. Section V summarizes the paper.

II. Preliminary examinations of the return data

Our sample of daily returns is for a broad stock index over the period January 1, 1902 through December 31, 1987.[2] The data, described in Schwert (1990), combine the returns on the Dow Jones index adjusted for dividends through 1925, returns on the CRSP value-weighted index for 1926 and 1927, returns on the S&P composite portfolio adjusted for dividends through June 1962, and returns on the CRSP value-weighted portfolio through 1987. Schwert's study of the statistical attributes of the spliced data series concludes they are homogenous; that is, seasonal patterns appear similar across various sample periods.

We examine the relationship of autocorrelations in the return series with levels of required margin in order to make inferences about the effect of margin on nontrading of stocks within our sample portfolio. Lo and MacKinlay (1990) demonstrate that nontrading of stocks

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[2] We are grateful to Bill Schwert who supplied the stock-return data.

within sample portfolios induces positive autocorrelation in the time series of returns for stock portfolios. If investors condition their trading activity on trading costs, then nontrading is likely to increase when required-margin levels increase. Suppose, for example, that traders restrict their trading activity to stocks whose returns are expected to exceed their cost of trading. Under these circumstances, any changes in trading costs implied by changes in margin levels would lead to changes in the number of stocks traded. Thus, margin levels are a plausible determinant of the nontrading probabilities: nontrading probabilities increase as the costs of maintaining margin deposits rise.

A further result of Lo and MacKinlay (1990) permits interpretation of the first-order autocorrelation coefficient as an estimate of the probability of nontrading of stocks within an index. Thus, the nontrading effect can be investigated by estimating autocorrelation coefficients conditional on their contemporaneous levels of required margin. The following specification is employed:

$$R_t = \delta_0 + \sum_{i=1}^{14} \delta_i D_i^{t-1} R_{t-1} + \varepsilon_t \tag{1}$$

where R_t are stock returns at t and the D_i^{t-1} are indicator variables, one for each of the fourteen levels of required margin during the sample period ordered from lowest to highest. Each of these indicator variables are set at unity when the required margin at t-1 is at level i; otherwise, they are set at zero. Estimates are reported in Table 1. The second column of the table lists the margin level associated with each coefficient. Generally, the coefficients interacting margin with lagged returns are larger at higher levels of required margin. For example, the sum of the coefficients at the highest seven levels of margin (the last seven coefficients listed) is 1.40973; while the sum of coefficients for the lowest seven levels of margin (the first seven coefficients listed) is .16889. This difference implies that the autocorrelation coefficient is positively related to levels of margin and indicates that the probability of nontrading increases with margin levels.

Table 1
Estimates of Autocorrelation Coefficients Interacted with Levels of Required Margin

$$R_t = \delta_0 + \sum_{i=1}^{14} \delta_i D_i R_{t-1} + \varepsilon_t$$

D_i are indicator variables for the fourteen levels of margin during the sample period (see Table 1) ordered from lowest to highest.

	Margin Level	Coefficient	t statistic
δ_0	na	0.00033	4.95
δ_1	20	0.02334	1.35
δ_2	25	0.02405	2.24
δ_3	30	-0.07724	-2.46
δ_4	40	0.03527	1.90
δ_5	45	0.02995	0.60
δ_6	50	0.16991	10.36
δ_7	55	-0.03639	-1.14
δ_8	60	0.14610	1.09
δ_9	65	0.33593	7.52
δ_{10}	70	0.13267	4.33
δ_{11}	75	0.12949	3.26
δ_{12}	80	0.36414	4.90
δ_{13}	90	0.17883	2.22
δ_{14}	100	0.12257	2.54

F Test for $\sum_{i=8}^{14} \delta_i - \sum_{i=1}^{7} \delta_i = 0$: 36.4

Critical values: 3.84 *and* 6.63 *with*, *respectively*, 5% *and* 1% *significance.*

The significance of this difference in summed coefficients is examined with an F test for their equality.[3] The F statistic is 36.4, easily rejecting the equality of these coefficient sums. The result implies an increase in nontrading at higher levels of margin, suggesting that trading activity is affected by margin levels. The next two sections examine price reversals to see if these changes in trading activity affect the relative proportions of information and noise traders.

III. Preliminary examination of stock-price reversals

Consider a class of traders having a propensity to trade in reaction to past price changes. For example, DeLong, Schleifer, Summers and Waldmann (1990) refer to traders following certain price-reactive strategies as positive-feedback traders. Similarly, Admati and Pfleiderer (1988) label traders realizing price changes which produce immediate needs for cash as liquidity traders. These trades are not information based in the sense of Black (1986) so we refer to them as noise traders. The presence of noise traders increases the chance that price over reactions will occur and that price changes will overshoot their fundamental values. Such overshooting increases the value of informed trading. This value motivates trading by information traders so that subsequent price changes can be expected to return to fundamental values. Black (1971) refers to the speed of price adjustment following noise-induced shocks as price resilience. This characterization of markets implies that prices can be expected to reverse following price shocks stemming from noise trading activity. The frequency of noise-trading shocks and, consequently, the frequency of reversals will be related to the relative importance of the two trader categories. Specifically, price reversals can be expected to occur more frequently when the proportion of information traders declines.

Some suggest that the cost of placing margin deposits plays a role in determining the relative importance of these two categories of traders. Such costs play a role similar to the transaction taxes suggested by Summers and Summers (1989). If low margins encourage a relative increase in the number of noise traders, then prices reverse more often. Conversely, if high margins cause a relative decrease in the number of noise traders, prices reverse less

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[3] Regressions were also run allowing for shifts in the intercept. The coefficients on margin interacted with lagged returns are substantially the same as those reported here.

often. Thus, an association between margin levels and reversals implies a relation between margins and uninformed trading.

Reversals, denoted r_t, are computed for the stock return sample, as follows:

$$r_t = \begin{cases} 1 & \text{if } \tilde{\varepsilon}_t \cdot \tilde{\varepsilon}_{t-1} < 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

where

$$\tilde{\varepsilon}_t = \tilde{R}_t - E(\tilde{R}_t | \phi_t) \tag{3}$$

Equation (2) specifies an indicator variable assigned a value of one on sample dates when the unanticipated portion of the return at t has the opposite sign as that of the unanticipated return at t-1; on other dates, the indicator variable is set to zero. Equation (3) states that unanticipated returns are computed as actual returns minus their corresponding expectations. Expected returns are generated according to three characterizations of the market. The first assumes that stock prices can be described by a martingale; that is, $E(R_t)=0$. The second assumes that stock prices are a submartingale with constant expected returns; that is, $E(R_t)=\alpha$. The third assumes that stock prices are a submartingale with time-varying expected returns; that is, $E(R_t)=\alpha\sigma_t$. The third approach estimates σ_t using the iterative method suggested by Schwert (1989) and extended in Bessembinder and Seguin (1993).

This iterative method first regresses the time series of stock returns on a constant. The absolute values of the residuals from this regression are used as risk estimates at each date in the sample. Returns are then regressed on ten lags of these risk estimates. This obtains risk-adjusted expected returns. Inclusion of the residuals from this second regression of returns on lagged-risk estimates incorporates temporal variation of risk into the expected return metric.

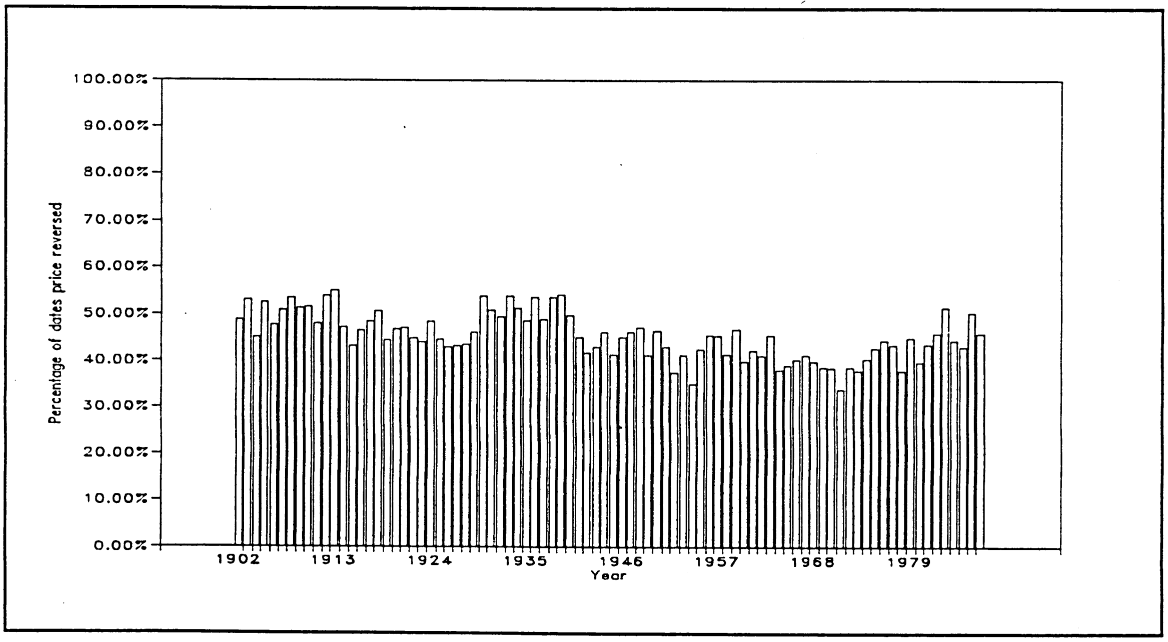
These reversals are classified according to their corresponding levels of required margin and the relative frequencies within these classifications are studied. Stating the frequency of reversals as a fraction of the number of observations provides a means of estimating the probability of a reversal possibly conditional on category i; that is,

$$\hat{P}_i = \frac{r_i}{n_i} \quad where \quad r_i = Number\ reversals\ in\ margin\ category\ i \qquad (4)$$

$$n_i = Number\ observations\ in\ margin\ category\ i$$

Figure 1 illustrates this approach. Reversals are computed according to the martingale assumption, then classified by their year of occurrence and their relative frequencies calculated as in equation 2. The figure graphs these probability estimates. Bar heights, labelled RMEAN, illustrate the relative frequency of stock reversals for each year of the sample. The graph suggests a modest but permanent decline in reversal probabilities occurring in the mid-1930s. Comparing pre- and post-1934 reversals, reversal occurrences averaged 48.4% of trading dates prior to 1934. After 1934, average reversal occurrences declined to 43.3% of trading dates.[4]

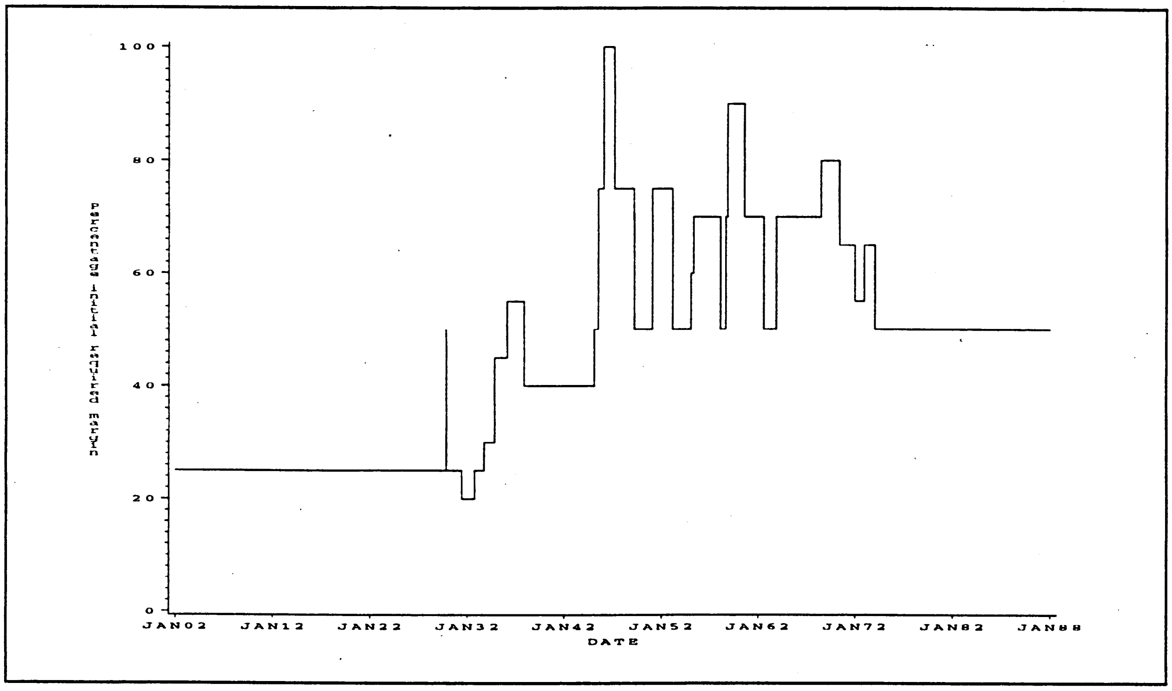
Figure 1: Yearly percentages of stock price reversals, 1902-1987. Reversals are calculated as in equation 1 assuming that stock prices are a martingale. Reversal occurrences are stated as a percentage of the trade dates of that year.



[4] A Student's t test adjusted for unequal variances rejects the equality of these means. The statistic is 5.61, indicating a reliable difference in the means of annual pre- and post-1934 reversal percentages at better than the 5% level.

Figure 2 gives margin requirements over this sample period. Initial margin requirements prior to October 15, 1934 were set by the industry. These were obtained from press accounts. After October 1934, margin requirements were set by the Federal Reserve's Board of Governors. We obtain these requirements and their effective dates from Hardouvelis (1990).

Figure 2: Required initial stock margins, 1902-1987 stated as a percentage of stock holdings. Required margins prior to 1934 are from news sources. After, 1934 initial margins were set by the Federal Reserve Board of Governors.



The higher margin requirements subsequent to their determination by regulatory authority does correspond to the lower reversal probabilities illustrated in Figure 1. However, the decline also corresponds to the increased regulation of the stock market through the provisions of the Securities and Exchange Commission (SEC). Alternatively, one might conclude that innovations such as those in trading or communications technology led to a change in the occurrence of reversals. These possibilities are more rigorously examined in the next section of the paper.

Table 2 reports percentages of reversal occurrence at each level of required margin. A more precise focus on the issues of this paper is obtained by classifying reversals according to the date on which the over reaction is hypothesized to have occurred. Thus, reversals occurring at t+1 are classified by the level of margin at t.[5]

Table 2
Initial Margin Requirements and Stock Price Reversals
Sample Period: 1902-1987

Initial Margin in Percent	*Number Observations*	*Percentage of Observations in which Stock Return Reversed:*		
		$E(R_t)=0$	$E(R_t)=\alpha$	$E(R_t)=\alpha\sigma_t$
20	410	50.244	50.244	49.756
25	8944	48.211	48.748	48.983
30	326	53.374	52.147	51.534
40	2182	47.434	48.808	47.709
45	390	50.256	51.795	50.256
50	5136	43.400	44.159	44.042
55	770	46.623	47.922	48.182
60	77	40.260	37.662	40.260
65	679	35.935	36.966	35.788
70	2382	41.478	42.149	42.569
75	1298	42.604	43.991	43.374
80	454	38.106	38.106	39.648
90	448	44.196	43.304	41.518
100	307	45.928	45.277	45.277
At all levels of margin:	23803	45.539	46.219	46.129

The table does suggest a relationship between conditional probability and margin requirements. The last row of the table gives the unconditional probability of a reversal for each of the expected-return models. Comparing these unconditional probabilities with the conditional probabilities in the corresponding columns, the conditional probabilities exceed the unconditional probability at each of the five lowest margin categories. For the remaining nine categories the unconditional probability is exceeded at the 55% margin level and at the 100% level for the

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[5] Classifying by the level of margin at t+1 does not alter our conclusions. This is not unexpected, as Figure 2 demonstrates required margin changes occur infrequently.

martingale series. This result suggests that, with few exceptions, margin levels are negatively related to the odds of observing stock-price reversals.

An alternate measure of reversal frequency is the time between the occurrence of stock-price reversals. Let $T_t(r_t=1)$ be the date of a reversal which occurs at time t, then $\tau_t = T_t(r_t=1)-T_{t-k}(r_{t-k}=1)$ gives the days since a reversal occurring k periods previously. These intervals can be measured in calendar units or in trading-day units. Measured in calendar time, the average time between reversals prior to October 15, 1934 was 2.49 days.[6] After this date, the average time between reversals increased to 3.11 days. This calendar time measure is dependent on the length of any intervening nontrading intervals and the presumption that reversals are uncorrelated with trading frequency. To avoid dependence on nontrading intervals, we also use a trading time measure: the number of trading days between reversals.[7] The mean number of trading days between reversals is 2.03 days prior to October 15, 1934 and 2.26 days after that date. Both measures indicate an increase in the time between reversals following the introduction of regulatory oversight. Thus reversals occur less often after this date. This is consistent with the decline in the relative frequency of reversals depicted in Figure 1.

To relate this effect to margin regulation we regress τ_t on the percentages of required initial margin at t. This specification considers the relationship of margin with the mean-time-between reversals.[8] Measuring the dependent variable in calendar units, the coefficient is .0175 and measured in trading time units it is .0066. Standard distributional assumptions about the errors of this regression imply that the coefficients of both regressions differ significantly from

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[6] At the inception of World War I, trading was suspended on the New York Stock Exchange. Thus, the first reversal (dated December 12, 1914) following the resumption of trading is excluded from the calculation of this mean.

[7] Dependence of reversals on the occurrence of a nontrading interval is suggested by evidence that expected returns vary by day of the week. DeGennaro (1993) summarizes the literature for day-of-the-week effects in stock prices. We introduce a control for this effect in Section IV.

[8] Changes in margin are much less frequent than reversals, thus relatively few observations are affected by a change of required margin during the period between reversals.

zero at better than the one-percent level.[9] These coefficients imply that higher levels of margin increase the mean time between reversals. In terms of the primary focus of this paper, higher levels of margin decrease the relative frequency of reversals. Thus, these statistics, the average times between reversals and the regression coefficients, offer an alternative means of stating the results indicated by Figures 1 and 2: margin levels rose in 1934 and reversals declined after that date. The next section restates these preliminary results in terms of their effects on conditional probabilities.

IV. Logit Specification

A. Estimating reversal probabilities conditional on margin level

Let Z_i represent an index which measures the propensity of the market to produce a reversal. Under the null that low margins encourage over reaction as demonstrated by stock-price reversals, then the index should be negatively related to levels of required margin. Thus, we would write

$$Z_i = \beta_0 + \beta_1 M_i \tag{5}$$

so that levels of the index are predicted by the product of ß and the level of margin. The over reaction null predicts that β_1 will be less than zero. The level of this index can also be described as determining the probability of encountering a reversal at the ith level of margin. This can be written as, $P_i = F(Z_i)$. Taking F() to be the cumulative logistic probability function, then the probability of a reversal is given by

$$P_i = F(Z_i) = \frac{1}{1 + e^{-Z_i}} = \frac{1}{1 + e^{-(\beta_0 + \beta_1 M_i)}} \tag{6}$$

Taking logs and re-arranging gives the following logit specification

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[9] However, Cox (1970, chapter 3) suggests this may be a strong assumption. The logit specifications of the next section avoid this criticism.

$$\log\left[\frac{P_i}{1 - P_i}\right] = \beta_0 + \beta_1 M_i + \tilde{e}_i \quad (7)$$

Equation (7) is estimated using the method of maximum likelihood. Matrix notation simplifies exposition of the likelihood function. Note that the expected value of Z_i can now be written $x_i'\beta$ so that the expression for the log likelihood is

$$\log l = \sum_{i=1}^{T} r_t \log[F(x_i'\beta)] + (1 - r_t)\log[1 - F(x_i'\beta)] \quad (8)$$

It is useful to compare our approach to studying reversals with that used by Stoll and Whaley (1990). Their measure of reversals signs the return at t based on the return at t-1: they multiply the return at t by -1 when the previous return is positive and by +1 when the return at t-1 is negative. Thus, their measure is positive when a reversal occurs and negative otherwise. Tests of hypotheses employing the Stoll-and-Whaley measure examine associations between explanatory variables and the expected portion of the reversal measure. Confirmation or rejection of these hypotheses requires the explained portion to exceed a quantity proportional to the estimated residual variance. Thus, their approach is subject to heteroskedasticity when the underlying return series is heteroskedastic. The logit approach introduced here uses only the sign of subsequent returns, this avoids dependence on the stationarity of the return distribution.

Table 3 reports our estimates of the logit specification given in equation (7). For each of the expected-return models, conditional probabilities are negatively related to initial margin requirements. The likelihood ratio test is used to evaluate the specifications.[10] The null of no effect is rejected for each of the return-generating models at better than the five percent level. The impact of a 1% change in required margin on the probability of a reversal is obtained from the expression

[10] See Judge et al. (1985, p. 767) for this test statistic.

$$\Delta PROB \approx \beta_0 \, [\hat{P}_i(1 - \hat{P}_i)] \tag{9}$$

To obtain the effect of margin on reversal probabilities, we evaluate this expression at the unconditional probabilities given in the last row of Table 2. In each case, the effect of margin on reversal probabilities, while statistically significant, is economically small.

Table 3
Maximum Likelihood Estimates of Price Reversal Variable on Margin

$$\log\left[\frac{P_i}{1 - P_i}\right] = \beta_0 + \beta_1 M_i + \tilde{e}_i$$

	Expected return method		
	$E(R_t)=0$	$E(R_t)=\alpha$	$E(R_t)=\alpha\sigma_t$
β_0	0.061594**	0.087633**	0.090183**
	(0.02213)	(0.01226)	(0.01148)
β_1	-0.005387**	-0.005355**	-0.005515**
	(0.00049)	(0.00035)	(0.00034)
$\Delta PROB$	-0.00134	-0.00133	-0.00137

Standard errors are in parentheses. All coefficients are significant at the 1% level.

Results reported in Table 3 indicate that an increase in required margin from the present 50% to 60% would reduce reversal probabilities by less than one percent, a very modest impact. The magnitude of this effect should be compared to the change in trading costs. Holding rates constant, the conjectured increase in required margin would increase the interest cost of placing margin deposits by 20%. Thus, a relatively large increase in the cost of carrying margined positions appears to have a small effect on reversal probabilities. However, Table 1 of Salinger (1989, p. 126) indicates that margined positions seldom exceed two percent of the market value of outstanding stock.[11] Thus, since relatively few positions are affected by the cost increase, the magnitude of the effect from a cost increase can also be expected to be small. Nevertheless,

[11] Moser (1992, p. 9) reports similar percentages of margined positions through 1988.

the possibility of other explanations should be investigated. One might, for example, conclude that the higher margin levels observed after 1934 are capturing impacts which are more properly attributed to other changes coming after that date. This possibility is explored in the next subsection.

B. Possibility that margin proxies for other effects

To control for the possibility that margin levels proxy for other explanations of reversal probabilities, the logit specification is augmented with the inclusion of two additional variables. An indicator variable is used to control for the difference in regulation in the pre- and post-1934 periods. The observation year is also added to control for differences in information and trading technology. Information technology might be expected to increase the speed at which information is disseminated and, thereby, impounded into stock prices. In particular one might expect thin trading to decline over the sample period.

These considerations suggest the following specification:

$$\log\left[\frac{P_i}{1 - P_i}\right] = \beta_0 + \beta_1 M_i + \beta_2 YEAR_i + \beta_3 REG_i + \tilde{e}_i \qquad (10)$$

where $Year_i$ is the year the reversal occurred and REG_i is an indicator variable set to unity following the introduction of stock market regulation by the Securities and Exchange Commission (SEC) on October 15, 1934 and to zero on the prior dates. As in the previous specification, the relevance of the classifying variables is indicated by a nonzero coefficient.

Table 4 reports results from this specification. As before, maximum likelihood procedures are used. The magnitude of the coefficients on margin levels decline but remain significantly less than zero. We reject the explanation that the margin coefficients of the previous specification are capturing the effects of regulatory oversight or innovations in trading and information technologies. Thus, we reject the possibility that margin levels proxy for other explanatory variables. As the focus of this paper is on the relevance of margin, the remaining coefficients are only summarized here leaving their further development to future research. The coefficients on year variables are significantly less than zero. This is consistent with the proposition that reductions in reversals can be attributed to innovations in information or trading technology during the sample period. On the other hand, the coefficient on regulatory oversight is reliably positive suggesting that regulation has increased the odds of reversals.

Table 4
Maximum Likelihood Estimates for the Augmented Regression

$$\log\left[\frac{P_i}{1 - P_i}\right] = \beta_0 + \beta_1 M_i + \beta_2 YEAR_i + \beta_3 REG_i + \tilde{e}_i$$

	Expected return method		
	$E(R_t)=0$	$E(R_t)=\alpha$	$E(R_t)=\alpha\sigma_t$
β_0	7.838990	7.907148	8.156308
	(0.02420)	(0.01903)	(0.02336)
β_1	-0.003882	-0.004756	-0.004186
	(0.00081)	(0.00077)	(0.00077)
β_2	-0.004068	-0.004083	-0.004217
	(0.00002)	(0.00002)	(0.00002)
β_3	0.100239	0.145948	0.115890
	(0.02294)	(0.01935)	(0.01913)
$\Delta PROB$	-0.000963	-0.001182	-0.001040

Standard errors in parentheses. All coefficients are significant at the 1% level.

C. Day-of-the-week effects on expected returns

DeGennaro (1993) summarizes extensive evidence that stock returns vary by day of the week. In particular, means of stock returns categorized by day of the week are typically positive with the exception of monday when mean stock returns are negative. The pervasiveness of this "monday effect" for various sample periods implies that stock-price reversals occur more frequently on mondays. We control for this day-of-the-week dependency by incorporating day-of-the-week effects into each of our models for expected returns. The martingale representation of returns is modified by regressing stock returns on an indicator variable for monday. The residuals from this regression then being classified as reversals as in equation (2). The constant-return submartingale representation adds this indicator variable to the expected return regression previously described. The time-varying submartingale model includes the monday-indicator variable in both stages of the expected return calculation. Results after introducing these controls do not change the inferences of the logit specifications reported in Tables 3 and 4. The magnitudes of all coefficients obtained after controlling for monday effects are very similar and the significance levels are not importantly changed. Thus, we do not report these results here.

V. Conclusion

Autocorrelations of the returns for a broad index are higher in periods when required margin is high. This implies an increase in the probability of nontrading and is suggestive of a negative relationship between margin and stock market participation. To see if the participation of information traders is more or less sensitive to changes in trading costs, we examine return reversals for a stock index from the period 1902 through 1987. Preliminary evidence suggests that reversal frequencies decreased substantially after 1934. This coincides with higher levels of required margin and with increased regulatory oversight of the stock markets. The results of our logit specifications imply that margin levels are negatively related to the probability of reversals. This permits us to reject the null that margin levels are unrelated to reversals. Alternate explanations for this result are investigated. Controls for time and for the introduction of regulatory oversight in 1934 do not explain changes in reversal probability. Also, our logit specifications appear robust to day-of-the-week effects.

Our statistical results indicate that high margins increase the extent of nontrading and that margin levels are negatively related to the probability of stock price reversals. Rejection of the null of no association implies that margin levels do influence the observed distribution of stock returns. The results coincide with the suggestions of Summers and Summers (1989): the cost of placing margin deposits acts as a tax. At low levels of this tax noise traders enter the market increasing the odds that prices will diverge from their fundamental levels. Reversions occur when prices return to their fundamental levels. At high levels of the tax, noise traders find it costly to participate and over reactions occur less often. Our findings suggest that information traders are less sensitive to these trading costs.

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