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EMPIRICAL EVIDENCE ON THE IMPACT OF EUROPEAN INSIDER TRADING REGULATIONS

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Abstract

We evaluate in this article the impact of the regulations on insider trading introduced between 1988 and 1994 on ten European securities markets. We consider the temporal behavior and the distributions of abnormal returns, market models, and time series models of time-varying mean returns and volatility, and conclude that the bulk of the evidence suggests that these regulations have had little (if any) impact on the series of returns of the markets in our sample.

Key Words

Insider trading. Securities Regulation. EU Directives.

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I- INTRODUCTION

The academic discussion on the issue of insider trading and its regulation started in the mid-1960s with the pathbreaking book by Manne (1966). Since then, a massive literature produced by lawyers, economists, and financial economists has addressed the theoretical impact of insider trading regulation (ITR) on securities markets.[1] This article is an attempt to evaluate the impact of ITR on securities markets from an empirical point of view.

The empirical literature on insider trading has basically followed three approaches. The first approach consists of determining, using data self reported by insiders, whether insiders obtain abnormal returns;[2] see, for example, the seminal articles by Jaffe (1974) and Finnerty (1976). The general consensus of this literature seems to be that insiders do obtain abnormal returns. To illustrate, Seyhun (1992) concludes that insiders obtained annual abnormal returns of 3.5% before 1980, 5.1% between 1980 and 1984, and 7% after 1984. This trend in insiders' abnormal returns is obviously at odds with the tightening of ITR observed in the US during the 1980s. Thus, Seyhun (1992) concludes that the increase in statutory sanctions during that period did not have a detrimental impact on insiders' abnormal profits.

The second approach seeks to infer the presence of insiders from time series of stock returns. This approach basically consists of analyzing the behavior of stocks around some corporate announcement in order to determine abnormal patterns that may hint the presence of insiders; see, for example, Keown and Pinkerton (1981) analyzing merger announcements, and John and Lang (1991) analyzing dividend announcements. The consensus of this literature seems to be that stock prices do move significantly before corporate announcements, and that they do it in a direction consistent with the presence of insiders in the market.[3] To illustrate, Keown and Pinkerton (1981) find that cumulative average abnormal returns become positive 25 days prior

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[1] Macey (1991) and Estrada (1994) may be useful (non-technical) introductions to the topic.

[2] Under Section 16 of the Securities Exchange Act of 1934, directors, officers and majority stockholders (owners of more than 10% of equity) must report their securities holdings and changes in holdings to the SEC on a monthly basis.

[3] See, however, Jarrell and Poulsen (1989), who argue that the abnormal behavior of stock prices before corporate announcements can be largely explained by rumors in the news media.

to the merger announcement date, that approximately half of their increase occurs prior to that day, and that a significant increase in trading volume precedes the announcement date.[4]

Finally, a third and more novel approach consists of using information that makes it possible to identify exactly when insiders enter the market and what transactions they make, thus making it feasible to analyze the impact of insider trading on the stocks involved. Meulbroek (1992), using SEC nonpublic files, studies the transactions of 320 individuals charged with insider trading by the SEC; Cornell and Sirri (1992), on the other hand, use court records to analyze the impact of insiders' transactions around the Anheuser-Busch's 1982 tender offer for Campbell-Taggart. To illustrate, Meulbroek (1992) finds that, in the days in which insiders made transactions, the mean abnormal return is 3.06% (and statistically significant), the cumulative abnormal return is 6.85% (and also statistically significant), and that in 81% of those days stock prices move in the same direction as they do upon public announcement of the relevant events.[5]

Our purpose is neither to determine whether European insiders have obtained abnormal returns, nor to determine whether European insiders traded before corporate announcements, nor to evaluate the impact of the transactions of European insiders on selected stocks. Rather, our goal is to evaluate the impact of ITR on the behavior of European securities markets. More precisely, we attempt to evaluate the impact of the regulations on insider trading imposed in ten European securities markets between 1988 and 1994. To that purpose, we summarize the behavior of each market in an index of representative stocks and ask two questions: First, we ask what changes are observed in several characteristics of the series of returns of each market after the imposition or tightening of ITR; and, second, we ask whether such changes, if any, have common features across the ten markets. Thus, if after controlling for factors affecting all markets, we observe that the markets in which ITR was imposed or tightened exhibit the same

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[4] Keown and Pinkerton (1981) also find that the increase in trading volume does not correspond to an increase in the trading volume of registered insiders, and infer that most insider trading is carried out through third parties in order to avoid detection.

[5] This last result gives support to the argument that insider trading increases the informational efficiency of securities markets by correcting securities prices in the right direction. Such a result, informally suggested by Manne (1966), has been formally established by Leland (1994) and Estrada (1995), among others.

qualitative changes, then we will conclude that those changes are likely to stem from the regulatory event. If, on the other hand, we observe no common pattern of change across markets, then we will conclude that the observed changes, if any, are likely to be due to factors missing from the model rather than to the imposition or tightening of ITR.

Our study is different from previous empirical studies on insider trading in several aspects. First, most previous studies have been performed for US markets; our study considers European markets. Second, most previous event studies on insider trading use corporate announcements as the events to be analyzed; the events considered in our study are the imposition or tightening of ITR. Third, most previous studies use data self-reported by insiders or data on individual stocks; our study uses aggregate data that summarizes in an index the behavior of each market. Fourth, as mentioned above, most previous studies focus on determining whether insiders obtain abnormal returns, or on detecting the presence of insiders before corporate announcements, or on evaluating the impact of insider trading on selected stocks; our study seeks to evaluate the impact of ITR on several characteristics of the series of returns of ten European securities markets.

The rest of this article is organized as follows. In part II, we describe the data and the basic methodology. In part III, we assess the impact of ITR on the temporal behavior and the distributions of abnormal returns, and on the market models that generate these returns. In part IV, we estimate GARCH models in order to evaluate the impact of ITR on mean returns and volatility. And, finally, in part V, we summarize the most important conclusions of the analysis. An appendix at the end of the article contains some tables and pictures, and a brief account of the evolution of ITR in the ten markets in our sample.

II- DATA AND METHODOLOGY

The sample under consideration consists of ten European markets that have either introduced or tightened ITR between 1988 and 1994; these markets are Austria (AUS), Belgium (BEL), Denmark (DEN), France (FRA), Germany (GER), Holland (HOL), Italy (ITA), Norway (NOR), Sweden (SWE), and Switzerland (SWI). The behavior of each of these markets is summarized by the Financial Times Actuaries World Index, published daily in the Financial Times. The sample size varies for each market; whenever possible, daily data has been gathered beginning approximately a year and a half before the imposition or tightening of ITR, and a year and a half after that regulatory event. The largest sample size is that of France (1,326 observations) and the smallest that of Germany (301 observations).

The regulatory events considered in this study are either the imposition or tightening of ITR. The former applies to those markets that prohibited ITR for the first time (Italy); the latter, on the other hand, applies to those markets that had ITR but tightened it in the sense that insider trading became a criminal offense (Austria), that penalties were increased (Sweden), or that the scope of the offense was broadened (Norway). One regulatory event is considered in seven out of the ten markets analyzed, and two regulatory events are considered in the other three markets; that yields a total of thirteen regulatory events, the earliest of which occurred in July of 1988 (in Switzerland), and the latest in August of 1994 (in Germany). Section A8 of the appendix contains a very brief account of the regulatory process in each of the markets in our sample.[6] Table 1 below summarizes only the dates of the regulatory events considered, the sample period for each market, and the number of observations in each sample and subsample.

TABLE 1: Event Dates, Sample Periods, and Sample Sizes

Market	Event 1	Event 2	Sample Period	T	T1	T2	T3
AUS	Oct-01-1993	.....	Apr-01-1992 / Feb-28-1995	759	391	368	.....
BEL	Sep-16-1989	Jan-01-1991	Mar-01-1988 / Jun-30-1992	1130	403	336	391
DEN	Aug-01-1991	.....	Feb-01-1990 / Jan-29-1993	781	389	392	.....
FRA	Jan-24-1988	Jul-21-1990	Jan-01-1987 / Jan-31-1992	1326	276	650	400
GER	Aug-01-1994	.....	Jan-01-1994 / Feb-28-1995	301	149	152	.....
HOL	Feb-16-1989	.....	Aug-03-1987 / Ago-31-1990	804	402	402	.....
ITA	May-21-1991	.....	Nov-01-1989 / Nov-30-1992	803	403	400	.....
NOR	Feb-10-1992	Mar-01-1993	Aug-01-1990 / Aug-31-1994	1065	397	275	393
SWE	Feb-01-1991	.....	Aug-01-1989 / Jul-31-1992	783	392	391	.....
SWI	Jul-01-1988	.....	Jan-01-1987 / Dec-29-1989	781	390	391	.....

T=number of observations for the whole sample period, T1=number of observations before the first regulatory event, T2=number of observations after the first regulatory event (or between events in markets with two events), and T3=number of observations after the second regulatory event.

In order to isolate the impact of ITR from the impact of other variables affecting all European markets, we use the standard methodology for event studies for daily data developed by Brown and Warner (1985). Thus, we estimate a market model of the form

[6] An extensive review of American, European, and Japanese regulations on insider trading can be found in Gaillard (1992).

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \,, \tag{1}$$

where R_{it} is the return on the ith market, R_{mt} is the return on the aggregate European market, α_i and β_i are coefficients to be estimated, ϵ_{it} is an error term, and the subscripts i and t index markets and time (trading days), respectively.[7] The coefficients α and β are estimated by OLS, and their standard errors are based on the Newey-West heteroskedasticity- and autocorrelation-consistent covariance matrix.[8] The return on the aggregate European market is computed as an equally-weighted average of the returns on twelve European markets.[9]

The series analyzed for each market is the series of residuals ($\hat{\epsilon}_{it}$), which are given by

$$\hat{\epsilon}_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \,. \tag{2}$$

Note that these residuals are *excess* (or abnormal) returns; therefore, throughout the article, we will refer to them as residuals, excess returns, abnormal returns, or, simply, as returns. In order to assess the impact of ITR on mean returns and volatility, we will estimate GARCH models in part IV. But we address before the impact of ITR on the temporal behavior and the distribution of abnormal returns, and on the market models that generate these returns.[10]

III- MARKET MODELS AND ABNORMAL RETURNS

We evaluate in this part the impact of ITR using four different approaches. First, we evaluate the temporal behavior of abnormal returns in order to assess the aggregate impact of ITR on the ten markets in the sample. Second, we evaluate whether the introduction or tightening of ITR has lowered the average cost of capital of the firms in each market, and, more

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[7] Returns for all markets are defined as the first difference of the natural logarithm of each index; that is, $R_t = 100*[\ln(I_t) - \ln(I_{t-1})]$, where I_t is the Financial Times Index on day t.

[8] There exist other methods to estimate market models; see, for example, Scholes and Williams (1977). However, as shown by Brown and Warner (1985), these more sophisticated methods do not produce significant improvements over OLS. See also Lo and MacKinlay (1990).

[9] These markets are Austria, Belgium, Denmark, England, France, Germany, Holland, Italy, Norway, Spain, Sweden, and Switzerland.

[10] Throughout the article all conclusions are drawn at the 5% significance level.

generally, whether the regulatory events caused a change in the models that generate abnormal returns. Third, we analyze preliminary evidence on the impact of ITR on mean returns and volatility. And, finally, we evaluate the impact of ITR on the pattern of linear and nonlinear dependencies in stock returns.

1.- Abnormal Returns

The aggregate impact of ITR on the ten markets in the sample can be gathered by analyzing the pattern of abnormal returns before and after the imposition or tightening of this regulation. To that effect, we focus on the first regulatory event in each country, thus analyzing the impact of ten events. In order to avoid event-driven biases, we first estimate the coefficients α and β using data for the first 200 trading days before the regulatory event.[11] Then, for each of the 200 trading days around the event (100 days before and 100 days after), we compute the daily average abnormal return (AAR), which is given by

$$AAR_t = \left(\frac{1}{N_t}\right) * \sum_{i=1}^{N_t} \hat{e}_{it} , \tag{3}$$

where N_t is the number of markets with returns available on trading day t. We also compute the cumulative average abnormal return (CAAR) between any two trading days t_1 and t_2; this CAAR is given by

$$CAAR_{t_1}^{t_2} = \sum_{t=t_1}^{t_2} AAR_t . \tag{4}$$

If the aggregate impact of ITR on the ten securities markets in the sample were nil, then both the AARs and the CAARs would fluctuate randomly over time. Figures A1 and A2 in section A1 of the appendix plot the AARs and the CAARs, respectively, for a period of 200 days around the regulatory events; in both figures, day 0 is the day of the first regulatory event in all markets. Figure A1 shows no clear pattern in the AARs, and although Figure A2 seems to show a pattern in the CAARs, it should be recalled that random walks usually appear to

[11] Except for Germany, in which case the market model is estimated with 149 observations.

display patterns when in fact none is present. Hence, more formal testing is called for.

We test the significance of abnormal returns using four statistics, two for AARs and two for CAARs. For the former, we compute the standard t-test and a sign (or runs) test; for the latter, on the other hand, we compute Brown and Warner's (1985) ratio of the CAAR to its estimated standard error with autocorrelation adjustments, and Corrado's (1989) nonparametric rank test. These statistics, computed not only for a period of 200 days around the regulatory events but for several other periods as well, are shown below in Table 2.[12]

TABLE 2: Analysis of Abnormal Returns

Period	$\%\hat{\epsilon}_{it}>0$	p-value	CAAR	BW-ratio	p-value	C-ratio	p-value
-100...100	53	0.429	46.32	0.52	0.378	0.52	0.435
-80...80	49	0.515	42.18	0.24	0.472	0.69	0.361
-60...60	52	0.615	40.81	0.37	0.421	0.89	0.288
-40...40	50	0.715	31.35	0.24	0.471	0.63	0.398
-20...20	51	0.327	17.35	0.43	0.414	0.92	0.276
0...100	48	0.213	24.01	0.27	0.464	0.47	0.454
0...80	49	0.515	19.73	0.37	0.421	1.18	0.231
0...60	53	0.429	11.89	0.52	0.327	1.29	0.208
0...40	50	0.715	10.87	0.61	0.313	0.87	0.279
0...20	49	0.515	7.16	0.75	0.221	0.81	0.299

The first columns shows the period (in trading days) for which AARs are computed. BW-ratio corresponds to equation (A.11) in Brown and Warner (1985). C-ratio corresponds to equation (8) in Corrado (1989).

The results in Table 2 are consistent across all procedures and point in the same direction, namely, that the introduction or tightening of ITR had no aggregate impact on the behavior of the ten European securities markets in the sample. The p-values of the sign test clearly cannot reject the null hypothesis that positive and negative AARs are randomly distributed, thus implying the absence of any pattern in the AARs. The p-values of both tests on the CAARs, on the other hand, clearly cannot reject the hypothesis that the CAAR is not significant in any of the time intervals for which AARs were estimated. In sum, the evidence presented in this section suggests that the imposition or tightening of ITR did not have a significant impact on European securities markets.

[12] The t-tests on each individual AAR are not reported in Table 2 but indirectly in Figure A1. The bands in that figure indicate two standard deviations above and below 0; hence, AARs that go beyond these bands are significant. Note from Figure A1 that the number of significant AARs is approximately equal to the number that would be expected due to chance.

2.- Changes in Market Models

The analysis of abnormal returns is based on the premise that, if the market model has changed after the regulatory event, the model estimated with data prior to the event will not fit the data well after the event; this poor fit, in turn, will generate large residuals, thus yielding significant AARs and CAARs. The analysis of abnormal returns thus addresses the issue of the aggregate impact of ITR; that is the impact of ITR by considering *all* the markets in the sample at once. However, the analysis of abnormal returns does not address the impact of ITR in a given market; we thus move to address whether the imposition or tightening of ITR has caused a change in the intercept or the slope of each individual market model.

A particularly interesting hypothesis to test is whether the slope of each market model decreased after the introduction or tightening of ITR. This is due to the fact that one of the traditional arguments for imposing this regulation is that it presumably increases investors' confidence in the market, thus decreasing the cost of capital of all firms;[13] see, for example, Brudney (1979). In our context, a market's beta (the slope of the market model) is directly related to the cost of capital of the firms in that market; hence, if the regulators' theory is correct, we would expect to observe, after the regulatory events, a significant decrease in the slope of the market models.

Preliminary evidence on the impact of the introduction or tightening of ITR on each of the ten markets in the sample can be obtained by inspecting the changes in the intercept and the slope of the market models estimated before and after the regulatory events. Such estimations are shown in Table A1, in section A2 of the appendix. However, in order to formally test for changes in the intercept or the slope of the market models, we re-estimate these models, for the whole sample period, after adding dummy variables representing the regulatory events. Thus, the augmented market model is given by

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[13] A firm's weighted average cost of capital (R_C) is given by $R_C=(1-t_c)\pi_D R_D+\pi_E R_E$, where R_D and R_E are the firm's return on debt and equity, respectively, π_D and π_E are the firm's proportions of debt and equity, respectively, and t_c is the corporate tax rate. The firm's return on equity, in turn, is given by an asset pricing model, typically the CAPM; thus, R_E, and, therefore, R_C are a positive (linear) function of the firm's beta. Hence, the higher the beta, the higher the firm's cost of capital.

$$R_{it} = \alpha_{0i} + \beta_{0i}R_{mt} + \alpha_{1i}ITR1_t + \beta_{1i}(R_{mt}*ITR1_t) + \alpha_{2i}ITR2_t + \beta_{2i}(R_{mt}*ITR2_t) + \epsilon_{it} \ , \qquad (5)$$

where ITR1 and ITR2 are two dummy variables such that ITR1=1 after the first regulatory event (and ITR1=0 before it), ITR2=1 after the second regulatory event (and ITR2=0 before it), and the αs and βs are coefficients to be estimated. Relevant results for the augmented market model in (5), for each of the ten markets in the sample, are shown below in Table 3.

TABLE 3: Augmented Market Models: Tests for Changes in α and β

Augmented Market Model: $R_t=\alpha_0+\beta_0R_{mt}+\alpha_1ITR1_t+\beta_1(R_{mt}*ITR1_t)+\alpha_2ITR2_t+\beta_2((R_{mt}*ITR2_t)+\epsilon_t$													
Market	α_0	p-value	β_0	p-value	α_1	p-value	β_1	p-value	α_2	p-value	β_2	p-value	R^2
AUS	-0.042	0.352	0.954	0.000	0.031	0.595	-0.224	0.032	....	....	....	....	0.36
BEL	-0.027	0.356	0.658	0.000	-0.028	0.562	0.001	0.994	0.066	0.151	0.064	0.643	0.42
DEN	0.025	0.419	0.678	0.000	-0.077	0.156	0.081	0.302	....	....	....	....	0.41
FRA	-0.086	0.194	1.029	0.000	0.107	0.138	-0.028	0.853	0.006	0.894	0.084	0.308	0.53
GER	-0.023	0.687	1.033	0.000	0.038	0.583	0.082	0.445	....	....	....	....	0.55
HOL	-0.031	0.459	1.348	0.000	0.001	0.988	-0.462	0.000	....	....	....	....	0.66
ITA	-0.054	0.222	0.943	0.000	0.032	0.686	0.054	0.666	....	....	....	....	0.35
NOR	-0.061	0.340	0.941	0.000	0.017	0.868	0.932	0.000	0.073	0.400	-0.707	0.000	0.45
SWE	0.009	0.863	1.276	0.000	-0.011	0.871	-0.139	0.187	....	....	....	....	0.57
SWI	-0.075	0.057	1.335	0.000	0.011	0.849	-0.098	0.564	....	....	....	....	0.64

ITR1=1 after the first regulatory event (and ITR1=0 before it), and ITR2=1 after the second regulatory event (and ITR2=0 before it). Significance based on the Newey-West heteroskedasticity- and autocorrelation-consistent covariance matrix.

Table 3 shows that the introduction or tightening of ITR did not have a significant impact in the intercept of any of the market models. More important, however, is the impact of the regulatory events on the slope of the market models for, as argued above, a decrease in the slope of a given market model would imply a lower cost of capital for the firms in that market. In terms of signs, Table 3 shows that the impact of the regulatory events is mixed; the slope of the market models decreases after six out of the thirteen events considered, and increases after the other seven. More importantly, these changes are significant in only four cases; after the events in Austria, Holland, and the second event in Norway, the slope of the market model decreases, and after the first event in Norway, the slope increases. Therefore, the data gives little (if any) support to the argument that ITR decreases the cost of capital of the firms in the market. In fact, the few significant changes found are likely to be due to factors missing from the market models rather than to the introduction or tightening of ITR.

The impact of ITR on the intercept and the slope of each market model is also important to determine whether the series of residuals for each market should be generated by one market model estimated for the whole sample, or by market models estimated for each subsample. If individual and joint tests of significance fail to reject the hypothesis of no change in the coefficients of a market model after the regulatory event (or events), then one market model can be estimated for the whole sample; this market model would then generate the series of residuals for that market. If, however, these tests reject the hypothesis of no change in the coefficients, then one market model would have to be estimated for each subsample, and each market model would then generate the residuals for each subsample.

Tests of significance for individual coefficients are shown in Table 3 and were discussed above; joint tests of significance are shown in Table A2, in section A3 of the appendix. These joint tests show that the market model has changed after only three out of the thirteen events considered; these changes have occurred after the regulatory event in Holland, and after each of the two regulatory events in Norway. Therefore, two market models are estimated for Holland (one before and one after the regulatory event), three market models are estimated for Norway (one before the first regulatory event, one between events, and one after the second event), and one market model for the rest of the markets in the sample. Note that in the case of Austria, the t-test on the slope of the market model implies that a significant change occurred after the regulatory event, but the joint test in Table A2 implies that the market model itself did not change. Given this contradictory evidence, residuals for Austria are estimated in two ways, namely, from one market model for the whole sample period, and from two market models (one for each subsample).[14] The market models used to generate the residuals to be used in the remainder of this study are reported in Table A3, in section A4 of the appendix.

3.- Changes in Mean Returns and Volatility

Several relevant characteristics of the distribution of returns generated by the market models reported in Table A3 are reported in Table A4, in section A5 of the appendix. This table

[14] All results to be reported for Austria correspond to the series of residuals generated by two market models; these results are virtually identical to those for the series of residuals generated by one market model for the whole sample.

may be useful to evaluate some preliminary evidence on the impact of ITR on the mean returns and volatility of European securities markets.

A comparison of mean returns before and after the regulatory events reveals that mean returns decreased after five of the thirteen events considered (the events in Austria, Denmark, and Sweden, the first event in Belgium, and the second event in Norway), and increased after the other eight events. Hence, the existence of a pattern in the reaction of mean returns to the imposition or tightening of ITR is far from clear. In addition, it should be clear that the sign of these changes obviously says nothing about whether these changes have been significant, an issue that will be formally addressed below.

A similar comparison can be made in terms of volatility. Table A4 shows that volatility has increased after five of the thirteen regulatory events considered (the events in Denmark and Italy, the first events in Belgium and Norway, and the second event in France), and decreased after the other eight events. Hence, there does not seem to be a clear pattern in the reaction of volatility to the imposition or tightening of ITR. Further, it should be clear that the sign of these changes says nothing about whether these changes have been significant, an issue that will be formally addressed below.[15]

4.- Changes in Linear and Nonlinear Dependencies in Stock Returns

Our goal in this section is to determine whether the introduction or tightening of ITR has had any impact in the pattern of linear and nonlinear dependencies in stock returns. To that effect, we compute Ljung-Box Q-statistics for 6, 18, and 30 lags in returns (to test for linear dependencies) and squared returns (to test for nonlinear dependencies); these statistics are reported in Table A5, in section A6 of the appendix.

In order to briefly address the issue of linear dependence, we focus on the Q-statistics for 6 lags in returns; in addition, we focus on those cases in which returns change from being

[15] The standard tests for differences in means and variances assume that the two samples under consideration are independent, an assumption that is not likely to hold in our context. Therefore, we have chosen not to perform those tests.

uncorrelated to significantly correlated, or from being significantly correlated to uncorrelated.[16] Such a significant change occurs after six out of the thirteen regulatory events considered. In three cases (after the events in Denmark, Germany, and Italy), the pattern of linear dependency increases significantly, and in the other three cases (after the event in Sweden and the first events in Belgium and Norway), the pattern of linear dependencies decreases significantly. These results could be interpreted as saying that, after the regulatory events, the market becomes more efficient (less predictable) in Belgium, Norway, and Sweden, and less efficient (more predictable) in Denmark, Germany, and Italy. Table A6, in section A7 of the appendix, reports the first six autocorrelations of returns for all markets before and after the regulatory events.

In order to briefly address the issue of nonlinear dependencies, we focus on the degree of volatility clustering in stock returns; that is, the tendency of large (small) changes in returns to be followed by large (small) changes in returns. To address this issue, we focus on the Q-statistics for 6 lags in squared returns (Q^2), and on those cases in which a significant change (as defined above) occurs. Such a change occurs after six out of the thirteen regulatory events considered. In three cases (the second event in Belgium, the first event in Norway, and the event in Sweden), the pattern of volatility clustering disappears after the regulatory event, and in the other three cases (the events in Austria and Germany, and the second event in Norway), a pattern of volatility clustering emerges after the regulatory event.

In sum, the reaction of linear and nonlinear dependencies in stock returns to the imposition or tightening of ITR does not seem to display a clear pattern. In fact, no significant reaction in linear and nonlinear dependencies is observed after more that 50% of the events considered; and in those cases in which the reaction is significant, it fails to be uniform across markets. Hence, these changes are likely to be due to factors missing from the market models rather than to the impact of ITR.

IV- MEAN RETURNS AND VOLATILITY

The preliminary conclusions discussed in the previous part about the impact of ITR on

[16] In other words, we disregard those cases in which the change observed after the imposition of ITR is only a matter of degree; that is, cases in which returns change from being uncorrelated to being still uncorrelated but to larger or smaller degree, or from being significantly correlated to being still significantly correlated to a larger or smaller degree.

returns and volatility can be more formally assessed within a time-series model of stock returns. Beginning with the pathbreaking article by Mandelbrot (1963), a vast amount of evidence has shown that stock returns exhibit a tendency for volatility clustering. Engle (1982) pioneered a way to model volatility clustering with the introduction of the ARCH model; that is, a time series model with time-varying conditional variances. Several authors since then have expanded this model, notably, Bollerslev (1986) with the GARCH model, Engle, Lillien, and Robbins (1987) with the ARCH-M model, and Nelson (1991) with the EGARCH model.

In order to test the impact of ITR on the mean return and volatility of European securities markets, we use the GARCH model introduced by Bollerslev (1986). Within the range of possible GARCH models, we estimate a GARCH(1,1); Bollerslev, Chou, and Kroner (1992), in their review of the ARCH literature, conclude that such a process captures the relevant features of time series of stock returns.

Let $\mu_t = E(R_t | I_{t-1})$ and $h_t = Var(R_t | I_{t-1})$ be the mean and variance of stock returns, respectively, both conditional on an information set (I_{t-1}). Further, let $u_t = R_t - \mu_t$ be a zero-mean, serially-uncorrelated error term with time-varying conditional variance h_t. In order to fit our purposes, we expand the GARCH(1,1) model by including dummy variables representing the regulatory events in both the mean equation and the variance equation. Thus, the model to be estimated for each market can be characterized by the expressions

$$R_t | I_{t-1} \sim N(\mu_t, h_t) \tag{6}$$

$$\mu_t = \delta_0 + \delta_1 R_{t-1} + \delta_2 R_{t-2} + u_t + \delta_3 u_{t-1} + \delta_4 u_{t-2} + \gamma_1 ITR1_t + \gamma_2 ITR2_t \tag{7}$$

$$h_t = \lambda_0 + \lambda_1 u_{t-1}^2 + \lambda_2 h_{t-1} + \gamma_3 ITR1_t + \gamma_4 ITR2_t \tag{8}$$

where ITR1 and ITR2 are two dummy variables that account for the introduction of the first and second regulatory events, respectively,[17] and the γs, δs, and λs are coefficients to be

[17] Exactly as before, ITR1=1 after the first regulatory event (and ITR1=0 before it), and ITR2=1 after the second regulatory event (and ITR2=0 before it).

estimated.[18] As in Akgiray (1989), among several others, we assume that $u_t|I_{t-1}$, and, therefore, $R_t|I_{t-1}$, are normally distributed with mean 0 and variance h_t.

The joint estimation of the conditional mean and the conditional variance of returns for each market is achieved in two steps: First, the most appropriate model for mean returns is selected; then, the selected process for the mean is jointly re-estimated with a GARCH(1,1) process for the variance, after adding the dummy variables that represent the regulatory events in both equations. The most appropriate process to model mean returns is selected by using the Schwarz criterium (SC); the competing models evaluated are the AR(1), AR(2), MA(1), MA(2), and ARMA(1,1). Not surprisingly, the mean returns of most series can be appropriately modelled with an AR(1) or an MA(1);[19] in fact, the SC selects a different process in only one case (Germany), for which the best model is an MA(2). The maximum likelihood estimations of the mean equations for each of the ten markets in the sample are reported below in Table 4.

TABLE 4: GARCH Models for (Conditional) Mean Returns

Conditional Mean: $\mu_t=\delta_0+\delta_1R_{t-1}+\delta_2R_{t-2}+u_t+\delta_3u_{t-1}+\delta_4u_{t-2}+\gamma_1ITR1_t+\gamma_2ITR2_t$

Market	δ_0	p-value	δ_1	p-value	δ_3	p-value	δ_4	p-value	γ_1	p-value	γ_2	p-value
AUS	0.0012	0.974	0.1737	0.000	.....	....	.....	....	-0.0096	0.845	.....	....
BEL	0.0043	0.821	0.0834	0.021	.....	....	.....	....	0.0048	0.886	0.0003	0.993
DEN	0.0366	0.425	.....	....	-0.3150	0.000	.....	....	-0.1401	0.054	.....	....
FRA	-0.0642	0.244	0.1036	0.001	.....	....	.....	....	0.0701	0.239	0.0451	0.232
GER	0.0161	0.751	.....	....	0.1877	0.002	-0.2168	0.000	0.0240	0.715	.....	....
HOL	-0.0207	0.466	.....	....	0.1399	0.000	.....	....	0.0191	0.605	.....	....
ITA	0.0017	0.971	.....	....	-0.2051	0.000	.....	....	0.0036	0.962	.....	....
NOR	-0.0108	0.840	.....	....	-0.1344	0.000	.....	....	0.0464	0.628	-0.0404	0.649
SWE	0.0180	0.663	0.1510	0.000	.....	....	.....	....	-0.0036	0.947	.....	....
SWI	-0.0192	0.625	.....	....	-0.0498	0.251	.....	....	0.0374	0.479	.....	....

ITR1=1 after the first regulatory event (and ITR1=0 before it), and ITR2=1 after the second regulatory event (and ITR2=0 before it). Second-order autoregressive coefficients (δ_2) were not required in any model.

The coefficients γ_1 and γ_2 measure the impact of the first and second regulatory events, respectively, on the mean returns of each market. In terms of signs, Table 4 shows that mean

[18] The restrictions that apply for the coefficients of the variance equation are $\lambda_0>0$, $\lambda_1\geq 0$, $\lambda_2\geq 0$, and, for the model to be covariance stationary, $\lambda_1+\lambda_2<1$.

[19] This follows from the fact that both the AR(1) and the MA(1) processes properly account for the autocorrelation introduced in the series by nonsynchronous trading.

returns have decreased ($\gamma_1 < 0$ or $\gamma_2 < 0$) after four events (those in Austria, Denmark, and Sweden, and the second event in Norway), and increased ($\gamma_1 > 0$ or $\gamma_2 > 0$) after the other nine events. Far more important, however, is the fact that *none* of these coefficients is significant; that is, the evidence shows that the imposition or tightening of ITR did not have any significant impact on the mean returns of any of the markets in the sample.

The maximum likelihood estimations of the GARCH(1,1) process for the variance of stock returns for each of the ten markets in the sample are reported below in Table 5. In these equations, the impact of the first and second regulatory events on volatility can be assessed through the coefficients γ_3 and γ_4, respectively.

TABLE 5: GARCH Models for the (Conditional) Variance of Returns

Conditional Variance: $h_t = \lambda_0 + \lambda_1 u_{t-1}^2 + \lambda_2 h_{t-1} + \gamma_3 ITR1_t + \gamma_4 ITR2_t$											
Market	λ_0	p-value	λ_1	p-value	λ_2	p-value	γ_3	p-value	γ_4	p-value	$\lambda_1+\lambda_2$
AUS	0.4025	0.000	0.0422	0.185	0.2355	0.126	-0.1324	0.004	.....	....	0.2777
BEL	0.0594	0.000	0.4469	0.000	0.3805	0.000	0.0503	0.004	-0.0316	0.071	0.8274
DEN	0.1019	0.001	0.1269	0.000	0.6963	0.000	0.0571	0.015	.....	....	0.8232
FRA	0.0836	0.001	0.1294	0.000	0.7954	0.000	-0.0507	0.007	0.0025	0.700	0.9248
GER	0.0414	0.266	0.0852	0.058	0.8070	0.000	-0.0125	0.420	.....	....	0.8922
HOL	0.0206	0.018	0.1099	0.000	0.8509	0.000	-0.0021	0.716	.....	....	0.9608
ITA	0.0075	0.272	0.0491	0.001	0.9417	0.000	0.0070	0.185	.....	....	0.9908
NOR	0.0544	0.004	0.0998	0.000	0.8428	0.000	0.0526	0.034	-0.0743	0.008	0.9426
SWE	0.0749	0.017	0.1006	0.001	0.8044	0.000	-0.0237	0.107	.....	....	0.9050
SWI	0.2396	0.000	0.2463	0.000	0.3975	0.000	-0.0205	0.533	.....	....	0.6438

ITR=1 after the first regulatory event (and ITR1=0 before it), and ITR2=1 after the second regulatory event (and ITR2=0 before it).

In terms of signs, the evidence is again mixed. Volatility increased ($\gamma_3 > 0$ or $\gamma_4 > 0$) after five out of the thirteen regulatory events considered (the events in Denmark and Italy, the first events in Belgium and Norway, and the second event in France), and decreased ($\gamma_3 < 0$ or $\gamma_4 < 0$) after the other eight events. Even more important, the change in volatility is significant after only six out of the thirteen events considered. More precisely, volatility increased significantly after the event in Denmark and the first events in Belgium and Norway, and decreased significantly after the event in Austria, the first event in France, and the second event in Norway. Therefore, the evidence shows that the changes in volatility observed after the regulatory events considered are not significant in more than half of cases, and, that when significant changes are observed, no clear pattern in the changes emerges. Hence, the significant changes in volatility observed are likely to be due to the impact of factors missing from the model rather than to the impact of ITR.

V- CONCLUSIONS

During the last thirty years, a vast literature has considered the issue of insider trading and has evaluated the theoretical benefits and costs of regulating this activity. In this article, we have attempted to evaluate the empirical impact of ITR by focussing on the regulations imposed between 1988 and 1994 in ten European securities markets.

Most of the evidence analyzed in this article points in the same direction; that is, to the fact that ITR has had little, if any, impact on the securities markets analyzed. The analysis of abnormal returns failed to detect an aggregate impact of ITR when considering all the markets in the sample at once. Individual and joint tests of significance on the market models, on the other hand, detected significant changes after the regulatory events in very few cases. In particular, the argument that ITR decreases the cost of capital of the firms in the market was seriously questioned by the evidence. And very few significant changes in the pattern of linear and nonlinear dependencies in stock returns occurred after the regulatory events.

The results of the GARCH models estimated to test the impact of ITR on mean returns and volatility were also consistent with the previous results. In particular, the evidence showed that the imposition or tightening of ITR did not have a significant impact on mean returns in any of the markets in the sample. The evidence also showed that over 50% of the regulatory events considered did not have a significant impact on volatility, and that in those cases in which the events did have a significant impact, no clear pattern in the reaction of volatility emerged. Therefore, as argued above, we are inclined to think that the significant changes we detected in the market models, in the pattern of linear and nonlinear dependencies, and in volatility are likely to be due to the impact of factors missing from the estimated models rather than to the impact of ITR.

We prefer not to draw hard conclusions at this point about the reasons for which investors in European securities markets have virtually ignored insider trading restrictions. The issue of enforcement, however, immediately comes to mind.[20] Casual empiricism suggests that very few resources are allocated in European markets to detect the presence of insiders; although we have no hard data to back this hypothesis, scattered evidence seems to point in this direction. It is thus natural to wonder, if the previous speculation is accepted, why monitoring is so lax. After all, is it reasonable to waste resources in discussing and writing a regulation that is later going to be virtually ignored?

One reason behind the lack of enforcement may be that insider trading is not considered so harmful in Europe as it is in the United States. In many European countries, notably in Germany, insider trading is considered as a part of doing business; see, for example, Standen (1995). It may be the case that European countries finally capitulated to the demands of the SEC and decided to impose ITR; but not being fully convinced that imposing ITR was the right thing to do, they put very little effort in enforcing this regulation. We obviously cannot back this speculation with hard data; but we can certainly argue, with the evidence we do have, that European markets have virtually ignored the restrictions on insider trading imposed in recent years.

[20] Directive 89/592/EEC, issued by the Council of the European Communities on November 13, 1989, provided that member states had to regulate insider trading, according to the guidelines given in the Directive, before June 1, 1992. However, the Directive did not create a central agency with the purpose of enforcing compliance; it merely provided that member states had to designate authorities responsible for the proper application of the insider trading prohibitions, and that these authorities were to be granted the necessary supervisory and investigative powers.

APPENDIX

A1- ANALYSIS OF ABNORMAL RETURNS

FIGURE A1: AVERAGE ABNORMAL RETURNS

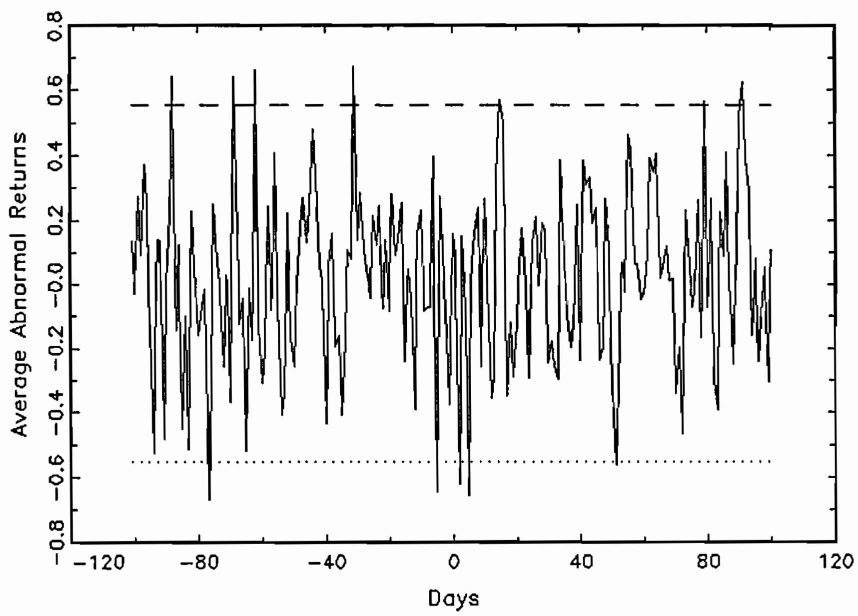
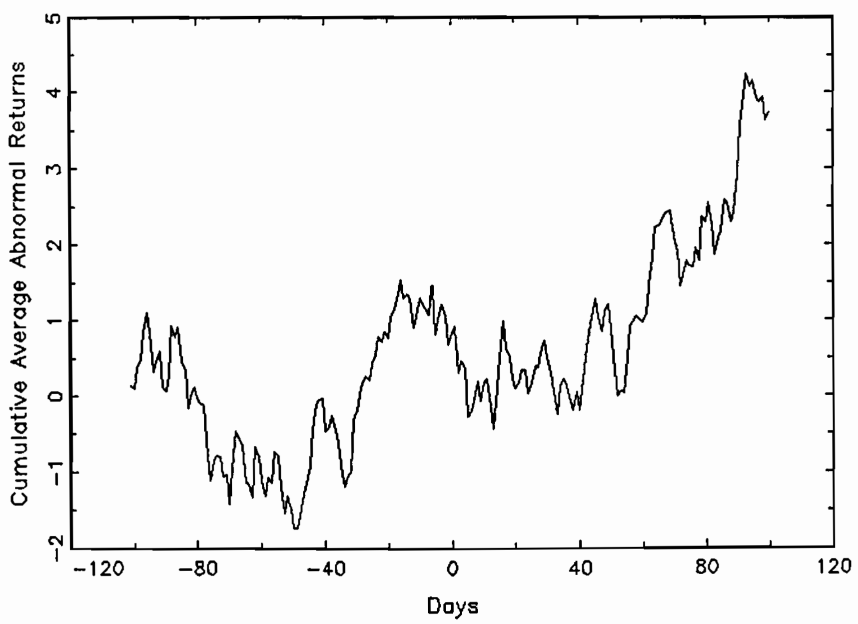


FIGURE A2: CUMULATIVE AVERAGE ABNORMAL RETURNS



A2- MARKET MODELS BEFORE AND AFTER THE REGULATORY EVENTS

TABLE A1: Market Models Before and After the Regulatory Events

Market Model: $R_t = \alpha + \beta R_{mt} + \epsilon_t$

Market	T	α	p-value	β	p-value	R^2	F-statistic	p-value
AUS	391	-0.0424	0.352	0.9540	0.000	0.3665	225.068	0.000
	368	-0.0111	0.766	0.7303	0.000	0.3358	185.075	0.000
BEL	403	-0.0267	0.357	0.6581	0.000	0.2464	131.144	0.000
	366	-0.0551	0.166	0.6593	0.000	0.4202	242.027	0.000
	391	0.0114	0.634	0.7230	0.000	0.5201	421.510	0.000
DEN	389	0.0246	0.419	0.6785	0.000	0.4903	372.325	0.000
	392	-0.0527	0.244	0.7598	0.000	0.3572	216.703	0.000
FRA	276	-0.0864	0.195	1.0287	0.000	0.5011	275.253	0.000
	650	0.0208	0.457	1.0009	0.000	0.4267	482.313	0.000
	400	0.0266	0.434	1.0844	0.000	0.6572	763.014	0.000
GER	149	-0.0229	0.688	1.0325	0.000	0.5208	159.787	0.000
	152	0.0149	0.702	1.1143	0.000	0.5896	215.513	0.000
HOL	402	-0.0307	0.460	1.3480	0.000	0.6809	853.464	0.000
	402	-0.0300	0.253	0.8857	0.000	0.5594	507.784	0.000
ITA	403	-0.0541	0.223	0.9425	0.000	0.4415	317.012	0.000
	400	-0.0220	0.738	0.9965	0.000	0.2893	162.048	0.000
NOR	397	-0.0609	0.341	0.9413	0.000	0.3506	213.275	0.000
	275	-0.0442	0.569	1.8734	0.000	0.5129	287.419	0.000
	393	0.0293	0.469	1.1667	0.000	0.4643	338.864	0.000
SWE	392	0.0094	0.863	1.2758	0.000	0.5904	562.240	0.000
	391	-0.0015	0.969	1.1365	0.000	0.5201	421.594	0.000
SWI	390	-0.0749	0.057	1.3346	0.000	0.6859	847.449	0.000
	391	-0.0638	0.136	1.2366	0.000	0.4821	362.046	0.000

T=number of observations. First rows show estimates for the period before the first regulatory event, second rows for the period after the first regulatory event (or between events in markets with two events), and third rows for the period after the second regulatory event. Significance based on the Newey-West heteroskedasticity- and autocorrelation-consistent covariance matrix.

A3- JOINT TESTS OF SIGNIFICANCE ON THE MARKET MODELS

TABLE A2: Joint Tests of Significance on the Market Models

Market	T	F_{ITR1}	p-value	F_{ITR2}	p-value	$F_{ITR1-ITR2}$	p-value
AUS	759	2.4214	0.8949	.....	.....	.....	.....
BEL	1130	0.1682	0.8453	1.0707	0.3431	0.7311	0.5708
DEN	781	2.0138	0.1342	.....	.....	.....	.....
FRA	1326	1.1062	0.3311	0.5555	0.5739	0.9792	0.4178
GER	301	0.3681	0.6924	.....	.....	.....	.....
HOL	804	12.2997	0.0000	.....	.....	.....	.....
ITA	803	0.1784	0.8367	.....	.....	.....	.....
NOR	1065	8.7943	0.0002	7.4620	0.0006	5.0317	0.0005
SWE	783	0.8798	0.4153	.....	.....	.....	.....
SWI	781	0.1665	0.8467	.....	.....	.....	.....

T=number of observations. F_{ITR1} and F_{ITR2} are the F-statistic for the null hypotheses $H_0:\alpha_1=\beta_1=0$ and $H_0:\alpha_2=\beta_2=0$, respectively. $F_{ITR1-ITR2}$ is the F-statistic for the null hypothesis $H_0:\alpha_1=\alpha_2=\beta_1=\beta_2=0$. Significance based on the Newey-West heteroskedasticity- and autocorrelation-consistent covariance matrix.

A4- MARKET MODELS USED TO GENERATE RESIDUALS

TABLE A3: Market Models Used to Generate Residuals

Market Model: $R_t=\alpha+\beta R_{mt}+\epsilon_t$								
Market	T	α	p-value	β	p-value	R^2	F-statistic	p-value
AUS	759	-0.0256	0.390	0.8495	0.000	0.3493	406.405	0.000
	391	-0.0424	0.352	0.9540	0.000	0.3665	255.068	0.000
	368	-0.0111	0.766	0.7303	0.000	0.3358	185.075	0.000
BEL	1130	-0.0222	0.203	0.6835	0.000	0.4174	808.094	0.000
DEN	781	-0.0145	0.596	0.7181	0.000	0.4064	533.293	0.000
FRA	1326	-0.0021	0.928	1.0431	0.000	0.5285	1484.084	0.000
GER	301	-0.0042	0.903	1.0668	0.000	0.5492	364.330	0.000
HOL	402	-0.0307	0.460	1.3480	0.000	0.6809	853.464	0.000
	402	-0.0300	0.253	0.8857	0.000	0.5594	507.784	0.000
ITA	803	-0.0387	0.328	0.9668	0.000	0.3511	433.363	0.000
NOR	397	-0.0609	0.341	0.9413	0.000	0.3506	213.275	0.000
	275	-0.0442	0.569	1.8734	0.000	0.5129	287.419	0.000
	393	0.0293	0.469	1.1667	0.000	0.4643	338.864	0.000
SWE	783	0.0028	0.935	1.2254	0.000	0.5652	1015.220	0.000
SWI	781	-0.0729	0.012	1.3135	0.000	0.6346	1353.157	0.000

T=number of observations. Results for AUS show both the market model for the whole sample period and the market models for each subperiod. Results for HOL show the two market models estimated. Results for NOR show the three market models estimated. Significance based on the Newey-West heteroskedasticity- and autocorrelation-consistent covariance matrix.

A5- SAMPLE MOMENTS OF THE DISTRIBUTIONS OF RETURNS

TABLE A4: Sample Moments of the Distributions of Returns

Market	T	Mean	SD	Min	Max	Skw	SSkw	Krt	SKrt
AUS	391	0.0000	0.8107	-3.9260	3.2849	-0.1390	-1.1223	2.5246	10.1902
	368	-0.0000	0.6384	-1.9533	2.6452	0.0811	0.6354	1.0492	4.1083
BEL	403	-0.0072	0.4800	-2.3583	2.1338	-0.3812	-3.1238	4.3976	18.0204
	336	-0.0314	0.6759	-2.6199	4.6422	1.0402	7.7842	9.2513	34.6151
	391	0.0344	0.4805	-1.8654	2.4907	0.0516	0.4168	2.2650	9.1422
DEN	389	0.0396	0.5424	-2.2319	2.0376	-0.0137	-0.1103	1.6554	6.6644
	392	-0.0393	0.7684	-3.7873	4.1675	-0.1266	-1.0232	5.8142	23.4980
FRA	276	-0.0835	1.2292	-4.5498	8.3946	1.3031	8.8380	11.4989	38.9948
	650	0.0189	0.6497	-2.8613	2.6605	-0.0102	-0.1066	1.6588	8.6328
	400	0.0269	0.6746	-1.6504	2.9698	0.4390	3.5847	1.5526	6.3384
GER	149	-0.0179	0.6737	-1.7057	2.1526	0.2012	1.0025	0.4089	1.0188
	152	0.0175	0.5352	-1.2857	1.4889	0.1310	0.6592	0.0190	0.0479
HOL	402	-0.0000	0.9550	-4.1045	4.7897	0.8034	6.5759	5.8192	23.8159
	402	0.0000	0.5712	-2.2757	1.7170	-0.2322	-1.9005	1.0970	4.4898
ITA	403	-0.0155	0.8475	-3.0018	2.7879	-0.1606	-1.3165	0.4645	1.9034
	400	0.0157	1.1547	-4.6257	4.4281	0.0689	0.5622	1.9426	7.9306
NOR	397	-0.0000	1.1053	-3.6438	3.3911	0.0462	0.3758	0.6739	2.7410
	275	0.0000	1.2912	-3.5572	8.1970	1.3452	9.1070	7.5346	25.5046
	393	-0.0000	0.7222	-2.2222	2.1748	-0.0828	-0.6702	0.1960	0.7931
SWE	392	0.0047	0.9231	-3.6736	3.8950	0.2897	2.3419	1.5895	6.4240
	391	-0.0047	0.7144	-2.4826	2.6998	0.1178	0.9506	1.0089	4.0721
SWI	390	-0.0020	0.9526	-4.6924	6.4718	0.8200	6.6107	9.0224	36.3704
	391	0.0020	0.7111	-6.2916	3.9731	-1.6701	-13.4823	19.5269	78.8164

T=number of observations. Mean returns, standard deviations (SD), minimum returns (Min) and maximum returns (Max) are all expressed in percentages. Skw=Skewness=m_3/s^3 and Krt=Kurtosis=m_4/s^4-3, where m_i and s are the ith sample moment and the sample standard deviation of the distribution, respectively; both coefficients computed with a finite-sample adjustment. SSkw=Standardized skewness and SKrt=Standardized kurtosis. First rows show estimates for the period before the first regulatory event, second rows for the period after the first regulatory event (or between events in markets with two events), and third rows for the period after the second regulatory event.

A6- LINEAR AND NONLINEAR DEPENDENCIES IN RETURNS

TABLE A5: Linear and Nonlinear Dependencies in Returns

Market	Q(6)	p-value	Q(18)	p-value	Q(30)	p-value	$Q^2(6)$	p-value	$Q^2(18)$	p-value	$Q^2(30)$	p-value
AUS	23.45	0.001	43.08	0.001	58.65	0.001	6.16	0.405	20.64	0.298	36.36	0.197
	13.62	0.034	32.04	0.022	55.88	0.003	16.63	0.011	27.74	0.066	36.65	0.220
BEL	19.08	0.004	31.09	0.028	37.54	0.162	79.81	0.000	94.38	0.000	119.71	0.000
	7.26	0.298	19.82	0.343	28.92	0.522	23.31	0.001	24.54	0.138	27.50	0.597
	5.46	0.486	22.56	0.208	35.69	0.219	3.88	0.692	15.06	0.658	23.33	0.802
DEN	9.34	0.155	15.91	0.599	35.27	0.233	10.09	0.121	14.51	0.696	45.30	0.036
	32.60	0.000	51.43	0.000	61.76	0.001	12.10	0.060	34.52	0.011	65.36	0.000
FRA	12.91	0.044	40.37	0.002	47.01	0.025	14.80	0.022	67.93	0.000	70.23	0.000
	21.16	0.002	26.01	0.099	34.13	0.276	60.22	0.000	89.01	0.000	100.67	0.000
	21.17	0.002	48.29	0.000	54.27	0.004	43.15	0.000	69.06	0.000	94.15	0.000
GER	10.35	0.111	21.20	0.270	32.09	0.363	9.03	0.172	23.53	0.171	28.76	0.530
	16.75	0.010	27.30	0.073	34.85	0.248	13.54	0.035	27.61	0.068	39.47	0.116
HOL	12.28	0.056	21.89	0.237	35.63	0.221	218.18	0.000	399.06	0.000	429.22	0.000
	4.82	0.567	22.42	0.214	40.52	0.095	16.67	0.011	26.39	0.091	33.08	0.319
ITA	12.38	0.054	26.46	0.090	37.24	0.170	29.13	0.000	62.35	0.000	94.15	0.000
	24.61	0.000	34.72	0.010	44.13	0.046	52.76	0.000	134.92	0.000	252.06	0.000
NOR	27.14	0.000	50.40	0.000	68.76	0.000	34.09	0.000	65.92	0.000	78.19	0.000
	6.63	0.356	29.57	0.042	39.36	0.118	8.02	0.237	12.81	0.803	14.66	0.992
	10.80	0.095	19.72	0.349	35.61	0.221	38.55	0.000	42.23	0.001	50.29	0.012
SWE	20.39	0.002	34.31	0.012	39.65	0.112	74.32	0.000	104.47	0.000	118.89	0.000
	9.29	0.158	24.01	0.155	39.20	0.121	10.20	0.117	13.72	0.747	22.14	0.849
SWI	16.08	0.013	42.50	0.001	58.36	0.001	168.90	0.000	184.07	0.000	193.90	0.000
	29.23	0.000	40.83	0.002	49.96	0.013	24.52	0.000	26.94	0.080	28.01	0.570

Q(k) and $Q^2(k)$ are the Ljung-Box Q-statistics for the first k autocorrelations in returns and squared returns, respectively; they are both distributed as χ^2_k. First rows show estimates for the period before the first regulatory event, second rows for the period after the first regulatory event (or between events in markets with two events), and third rows for the period after the second regulatory event.

A7- AUTOCORRELATIONS IN RETURNS

TABLE A6: Autocorrelations in Returns

Market	ρ_1	s_1	ρ_2	s_2	ρ_3	s_3	ρ_4	s_4	ρ_5	s_5	ρ_6	s_6
AUS	0.18	0.05	0.01	0.05	-0.12	0.05	0.04	0.05	0.09	0.05	0.04	0.05
	0.14	0.05	0.08	0.05	-0.04	0.05	-0.04	0.05	0.07	0.05	-0.05	0.05
BEL	0.13	0.05	0.11	0.05	0.02	0.05	-0.05	0.05	-0.04	0.05	-0.11	0.05
	0.09	0.05	0.01	0.05	-0.07	0.05	0.01	0.05	-0.01	0.05	0.09	0.05
	0.03	0.05	-0.04	0.05	-0.07	0.05	0.08	0.05	0.01	0.05	-0.02	0.05
DEN	0.10	0.05	0.02	0.05	0.04	0.05	-0.01	0.05	-0.10	0.05	-0.04	0.05
	0.25	0.05	-0.04	0.05	-0.01	0.05	-0.04	0.05	-0.06	0.05	-0.12	0.05
FRA	-0.13	0.06	0.08	0.06	-0.04	0.06	-0.07	0.06	0.05	0.06	-0.11	0.06
	0.12	0.04	0.02	0.04	0.06	0.04	0.09	0.04	0.06	0.04	0.05	0.04
	0.09	0.05	-0.07	0.05	-0.06	0.05	0.04	0.05	-0.15	0.05	-0.11	0.05
GER	-0.11	0.08	0.21	0.08	0.06	0.08	0.03	0.08	0.06	0.08	0.06	0.08
	-0.27	0.08	0.18	0.08	0.01	0.08	-0.01	0.08	-0.05	0.08	-0.04	0.08
HOL	-0.11	0.05	-0.01	0.05	-0.10	0.05	0.07	0.05	0.03	0.05	-0.02	0.05
	-0.08	0.05	-0.05	0.05	0.02	0.05	-0.05	0.05	0.02	0.05	0.02	0.05
ITA	0.10	0.05	-0.09	0.05	0.08	0.05	-0.04	0.05	-0.08	0.05	-0.01	0.05
	0.22	0.05	-0.03	0.05	-0.01	0.05	-0.02	0.05	-0.10	0.05	-0.03	0.05
NOR	0.19	0.05	0.03	0.05	0.00	0.05	-0.04	0.05	-0.16	0.05	-0.07	0.05
	0.08	0.06	-0.12	0.06	-0.01	0.06	-0.03	0.06	-0.03	0.06	0.02	0.06
	0.15	0.05	0.04	0.05	0.01	0.05	0.00	0.05	-0.05	0.05	-0.04	0.05
SWE	0.19	0.05	0.02	0.05	0.09	0.05	-0.04	0.05	-0.03	0.05	-0.07	0.05
	0.08	0.05	0.10	0.05	0.03	0.05	0.01	0.05	0.08	0.05	0.01	0.05
SWI	-0.16	0.05	-0.05	0.05	-0.09	0.05	0.00	0.05	0.06	0.05	-0.03	0.05
	0.14	0.05	0.06	0.05	-0.07	0.05	-0.20	0.05	-0.06	0.05	-0.06	0.05

ρ_k and s_k indicate the kth autocorrelation and its asymptotic standard error, respectively. First rows show estimates for the period before the first regulatory event, second rows for the period after the first regulatory event (or between events in markets with two events), and third rows for the period after the second regulatory event.

A8- EUROPEAN INSIDER TRADING REGULATIONS

We include in this section a very brief summary of the evolution of ITR in the European markets considered in this article. The dates of the events we consider are in italics.

Austria. The first Austrian provisions against insider trading were issued in 1987, when the Vienna Stock Exchange issued the Guideline for the Prevention of Insider Trading. These guidelines were voluntary contractual penalty agreements with the Stock Exchange members. On November 1, 1989, a new Stock Exchange Act came into effect, making the voluntary agreements compulsory and superseding the Guideline. However, in what refers to insider trading, this Act was very general; it merely delegated the power to make enforceable rules to the Council of the Vienna Stock Exchange. Based on this authority, the Insider Regulation of the Vienna Stock Exchange Council was issued in 1990. Insider trading finally became a criminal offense on *October 1, 1993*.

Belgium. Insider trading has been prohibited in Belgium since *September 16, 1989*, when Article 509-4 was incorporated into the Belgian Criminal Code. This statute was enacted, among other purposes, with that of adapting Belgian laws to the EC Directive. However, soon after its adoption, it became clear that the Article was incomplete and not in compliance with several provisions of the Directive. Thus, ITR was completely revised by the Statute on Financial Operations and Financial Markets of December 4, 1990, which came into effect on *January 1, 1991*. Article 509-4 was completely replaced by part V of the Statute, thus now being generally in line with the EC Directive.

Denmark. Until 1987, the pricing of and trading in securities listed in the Copenhagen Stock Exchange was addressed only by recommendations issued by the Exchange. The Rules of Ethics adopted by the Exchange in 1979 were only guidelines; violations of these guidelines could not be sanctioned. The Danish Stock Exchange Act was enacted on January 1, 1987; insider trading was prohibited by Section 39 of this Act. In mid-1990, the Minister of Industrial Affairs formed a commission with the task, among others, of adapting ITR to the EC Directive and making insider trading a criminal offense. The commission's proposed amendments to section 39 of the Act (a new Chapter 11) were enacted on June 6, 1991, and came into effect on *August 1, 1991*.

France. Insider trading was first made illegal in France on December 23, 1970, through Article 10-1 of the Ordinance that just over three years before had created the French Securities and Exchange Commission (Commission des Opérations de Bourse, COB), on September 28, 1967. Subsequent modifications of the 1967 Ordinance on January 3, 1983, and January 22, 1988 (effective *January 24, 1990*), broadened the scope of the offense and increased its penalties. The later modification, in particular, significantly increased the COB's investigative power. On August 2, 1989, the COB was given the authority to impose administrative sanctions for violations of its own regulations; as a response, on July 17, 1990, the COB promulgated Regulation 90-08 specifically directed against insider trading; this regulation came into force on *January 21, 1990*. Thus, there are two sets of rules that apply to insider trading in France: the 1967 Ordinance and its amendments, and the COB Regulation 90-08.

Germany. In November of 1970, the Voluntary Insider Trading Guidelines and the Broker and Investment Advisor Rules were put into effect; they were later revised in 1971, 1976, and 1988. The Guidelines were voluntary and adherence was based upon contract. Most corporations required senior management and potential insiders to enter into contracts with the corporation assenting adherence to these Guidelines and the Code of Procedure. Regulations that made insider trading a criminal offense were implemented on *August 1, 1994*.

Italy. The first Italian law specifically addressing insider trading (Law 153) was enacted on May 17, 1991, and came into force on *May 21, 1991*. Until then, no regulation in Italian law prohibited insider trading, although attempts had been made to apply regulations conceived for other purposes to insider trading. Law 153 satisfies the requirements of the EC Directive.

Holland. Insider trading has been prohibited in Holland since *February 16, 1989*, day in which Article 336a of the Dutch Criminal Code came into force. However, as early as 1973, the Committee on Corporate Law set up by Minister of Justice had already recommended penalties for insider trading. The Dutch criminal provisions were put into effect before the publication of the EC Directive; they satisfy the Directive fully, and, in some respects, they go even further.

Norway. The first Norwegian regulations on insider trading were contained in Act 61 of June 14, 1985 on Securities Trading, which came into effect on October 15, 1985. This Act was later amended (adding sections 6a and 6b) by Act 75 of November 8, 1991. Sections 6a and 6b came into effect on *February 10, 1992*, and other parts of section 6 on *March 1, 1993*.

Sweden. In the early 1970s, insiders in listed companies were required to disclose the holdings (and changes in holdings) in their companies, but the legislation contained no sanctions for insider offenses. In the mid-1980s specific criminal sanctions were introduced for insider trading offenses through the Securities Market Act (SFS 1985:571), which came into effect on October 1, 1985. After a complete reevaluation of securities markets regulations, the Insider Act (SFS 1990:1342) was adopted and came into effect on *February 1, 1991*. This new act broadened the definition of insiders, extended the prohibition to all kinds of instruments in the securities markets, and increased the severity of the sanctions.

Switzerland. On November 16, 1981, in the case *St. Joe Mineral v. BSI*, the federal district court of the Southern District of New York subjected a Swiss bank to a significant daily fine for as long as it refused to reveal information to the SEC about the name of a client for whom transactions had been made in the American stock market. This ruling provided incentives, already under way, to enact regulations against insider trading. On August 31, 1982, a Memorandum of Understanding (MOU) was signed between Switzerland and the US concerning collaboration in matters of mutual legal assistance. Convinced of the need for action the Swiss congress decided to focus on insider trading. A bill was approved on December 18, 1987, and a new MOU was signed with the US on November 17, 1987. Insider trading was finally prohibited in Switzerland on *July 1, 1988*, day in which Article 161 of the Swiss Penal Code came into effect. Under this Article, insider trading is a criminal offense.

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