A Note on the Effects of the Initiation of Major Market Index Futures on the Daily Returns of the Component Stocks

Francis E. Laatsch

The effects of stock index futures trading on returns of the index component stocks (and on stocks in general) is of concern to market participants, regulators, and academics. Harris (1989) demonstrates that following the introduction of futures trading, the volatility of the S&P 500 component stocks increases *relative to* the volatility of a control group of non-S&P stocks. This article reports the results of a similar study of the effects of the introduction of Major Market Index (MMI) futures trading. Volatility of the MMI component stocks does not appear to be greater since the introduction of MMI futures trading, in either absolute or relative terms, to the volatility of two control groups used in the study.

Interpretation of a failure to find discernable effects from the introduction of MMI futures trading suffers from several potentially confounding factors.[1] AMEX trading in MMI options began in April 1983, predating MMI futures trading by more than one year. Thus, MMI options trading could have affected the performance of the MMI stocks making any *further* change small. Furthermore, all 20 of the MMI stocks are included in the S&P 500 and a futures contract for the S&P began trading in April 1982, predating both MMI options and futures. It must be noted also that a "critical mass" of trading may be required before any effects of stock index futures trading on the component stocks can be noticed. MMI futures and options volumes have never approached those of S&P contracts.

The S&P 500 contract dominates stock index futures trading and is studied by Harris (1989) in a manner quite similar to the research design of this study, yet the MMI brings some advantages to further analysis. With only 20 stocks in the index, selection of control groups through direct examination of various accounting attributes of the stocks is possible. Such an approach is computationally intractable using broader indexes. Harris, for example, selects his control groups using an al-

I wish to thank two anonymous referees and the editor of this journal for their helpful comments and suggestions. I, of course, remain responsible for any remaining errors.

[1]Although not reported in this note, the effects of MMI options trading initiation are studied also by the author and are available on request. The results of the options study indicate that initiation of MMI options does not significantly affect the performance of the MMI stocks relative to the performance of the control groups.

Francis E. Laatsch is an Assistant Professor of Finance at Bowling Green State University.

The Journal of Futures Markets, Vol. 11, No. 3, 313–317 (1991)

CCC 0270-7314/91/030313-05$04.00

gorithm which minimizes distances between the S&P stocks' values and the control stocks' values *for the variables already selected for the regression model* used in studying futures trading effects. Furthermore, composition of the MMI has not changed (while that of the S&P 500 changes quite often). This obviates difficulties in attempting to control for additions and deletions to the index.

This study differs from Harris in that a different index is used, a different control group matching technique is used, and the test statistics are generated from separate single factor market model regressions rather than a multiple regression approach.

RESEARCH DESIGN

Many factors other than the initiation of futures trading can affect stock returns, including those of index component stocks, across the period analyzed in this study. Assertions that observed changes in component stocks' returns after the initiation of futures trading are caused by futures trading, run a clear risk of *post hoc, ergo propter hoc* fallacy. An element of control against this fallacy can be gained by forming comparison (control) groups and analyzing these groups as well. Differences in the response patterns of the comparison groups relative to the MMI stocks may allow a clearer presentation of the effects, if any, of futures trading.

Two comparison groups are formed. One control group is selected by matching candidate stocks to the MMI companies, using a technique based, in part, on Pinches, Mingo, and Caruthers (1973) factor analysis results. Table I contains the MMI stocks, control group 1 (the matched stocks), and control group 2, which consists of 20 randomly selected stocks. Membership in an index contract is not consid-

Table I
COMPONENT STOCKS OF THE MMI AND THE CONTROL GROUPS

MMI Stock	Group 1	Group 2
American Express	Transamerica Corp.	Abbot Laboratories
AT&T	Bell Canada Ent.	Armstrong World Ind.
Chevron	Amoco Corp.	Interlake
Coca-Cola	General Cinema	Potlatch Corp.
Dow Chemical	Monsanto Co.	Air Products and Chem.
DuPont de Nemours	Union Carbide	Occidental Petroleum
Eastman Kodak	Xerox Corp.	Federal Paper Board
Exxon	British Petroleum	Emerson Electric
General Electric	Westinghouse Elect.	Dover Corp.
General Motors	Ford Motor Co.	Trinova Corp.
IBM	Hewlett-Packard	Anheuser Busch
International Paper	Boise Cascade	General Signal
Johnson & Johnson	Pfizer, Inc.	Owens-Illinois
Merck	American Home Prod.	Staley Continental
MMM	Dennison Mfg. Co.	TRW
Mobil	Texaco, Inc.	EG&G
Phillip Morris	American Brands	Winnebago Industries
Procter & Gamble	Colgate-Palmolive	Diamond Shamrock
Sears, Roebuck	J.C. Penney Co.	Varian Assoc., Inc.
USX	Sun Co., Inc.	G. Heileman Brewing

ered in selecting either control group. However, with the exceptions of Dennison, Winnebago, and Heileman, the control groups' stocks are included in at least one of the indices underlying a futures or option contract at the time MMI futures trading began: the S&P 500, the FTSE 100 (British Petroleum), the TSE 300 (Bell Canada), the AMEX Oil and Gas (Diamond Shamrock), or the PSE Technology (Varian).

For each of the 60 stocks in the study, daily returns for the period from June 1982 (two years before the beginning of MMI futures trading) through August 1986 (two years after MMI futures trading) are obtained from the Center for Research in Securities Prices (CRSP) tapes. Daily returns of the S&P 500 index are also from the tape and used to proxy the market in a standard market model regression. Market model parameters are estimated using data from the period June 1982 through June 1984. Data from the period August 1984 through August 1986 are compared with the market-model predicted returns, using the estimated relationship. Deviations from the market-model predictions (prediction errors) form the basis of subsequent analysis.[2]

If futures trading has discernibly affected the risk-reward characteristics of the index component stocks, then different patterns of prediction errors should be observed for MMI versus non-MMI stocks. Both standard OLS estimates and Cohen et al. (1983) adjusted-betas are calculated and applied to the post-futures data.[3] In event-study fashion, the following tests are conducted in this study: tests of mean prediction errors being different from zero (test-statistic denoted Z_{Vt}), tests of the post-event variance of the prediction errors being different from the pre-event variance (test-statistic denoted Z_{Ut}), and tests of the cumulative mean residuals.

RESULTS

Under the null hypothesis of no changes, the Z_{Vt} and Z_{Ut} values should be unit normally distributed. The means, standard deviations, skewness, and kurtosis of the Z_{Vt} and Z_{Ut} values are reported in Table II. The Kolmogorov test assesses whether the Z_{Vt} and Z_{Ut} are normally distributed. Patell (1976, p. 57) provides a test-statistic appropriate to test whether the cumulative level of prediction errors differs from zero. For all 3 groups, Z_{Vt} appears distributed roughly in accordance with the distribution expected under the null hypothesis. Tests of the cumulative prediction errors indicate that the introduction of MMI futures trading is not associated with statistically significant effects on the risk-adjusted returns of the 3 groups.

Tests of changes in the variances of the post-futures, risk-adjusted returns are reported in the lower portion of Table II. Note that the mean Z_{Ut} values are negative, indicating that variance of the prediction errors is lower than expected. This hardly provides support for the contention that futures trading increases volatility. The Z_{Ut} values do not appear to be normal and they do not have means equal to zero. The distributions are extremely fat-tailed and right-skewed. Note that all 3 groups exhibit approximately the same degree of deviation from unit normality. Clearly something is affecting risk-adjusted variances; it is not clear if that "something" is the initiation of futures trading.

[2]All tests regarding futures initiation are run also using the period from May 1983 through June 1984 as the pre-event period. This reduces the potential confounding of pre-options conditions and pre-futures conditions. Results based on this modified pre-futures period do not materially differ from those reported in this note.

[3]Tests results using Generalized Least Squares (GLS) estimation are available from the author. GLS results do not materially differ from those based on OLS regression.

Table II
TRADITIONAL OLS APPROACH

	MMI	Group 1	Group 2
Level of Prediction Errors, Z_{Vt}:			
Mean	−0.04	−0.03	−0.06
SD	1.05	0.91	1.00
Skewness	0.28	0.07	0.06
Kurtosis	0.75	0.32	0.33
Kolmogorov test of normality			
D-statistic	0.04	0.03	0.02
Approx. *P*-value	0.15	>0.15	>0.15
Tests of cumulative prediction errors			
Z-statistic	−1.41	−0.72	−1.00
Approx. *P*-value	0.16	0.47	0.32
Variance of Prediction Errors, Z_{Ut}:			
Mean	−0.49	−0.31	−0.52
SD	1.84	2.04	1.96
Skewness	2.59	3.35	3.82
Kurtosis	9.92	18.89	23.49
Kolmogorov test of normality			
D-statistic	0.14**	0.15**	0.15**
Approx. *P*-value	<0.01	<0.01	<0.01

*Significant at the 10% level. **Significant at the 5% level.

Tests based on the Cohen et al. (1983) adjusted-beta regressions are reported in Table III. The results are similar to those of Table II with the exceptions of the MMI cumulative prediction errors result and the Z_{Vt} Kolmogorov tests for control group 1. The cumulative prediction errors for the MMI stocks are statistically significantly different from zero (at 10%, two-tailed test), while those of the control groups are not.

CONCLUSIONS

This research finds very little evidence that the introduction of Major Market Index futures trading has changed the performance of the MMI component stocks, either absolutely or relative to the performance of the control groups stocks. The cumulative prediction errors for the MMI stocks, under the Cohen et al. regression approach, are significantly different from zero (albeit only at the 10% significance level instead of the more often used 5% level), while those of the control groups are not. The strength of this result is reduced by the failure of the traditional OLS event-study approach to confirm the differential response pattern.

As for changes in the variances of the prediction errors, the clear departure of the Z_{Ut} statistics from the unit normal distribution of the null hypothesis should be further investigated. Nonetheless, no clear, markedly distinguishable differences in the patterns of the Z_{Ut}, for the MMI stocks versus the control group stocks, can be observed. In particular, the proposition that the introduction of MMI futures trading has increased the volatility of the component stock returns is not supported. Hence, the mean Z_{Ut} values for the MMI stocks, as well as the control groups

Table III
COHEN ET AL. ADJUSTED APPROACH

	MMI	Group 1	Group 2
Level of Prediction Errors, Z_{Pi}:			
Mean	−0.03	−0.04	−0.08
SD	1.06	0.92	1.02
Skewness	0.30	0.02	−0.01
Kurtosis	0.75	0.28	0.14
Kolmogorov test of normality			
D-statistic	0.03	0.04**	0.03
Approx. *P*-value	>0.15	0.05	>0.15
Tests of cumulative prediction errors			
Z-statistic	−1.92*	−0.89	−0.79
Approx. *P*-value	0.05	0.37	0.43
Variance of Prediction Errors, Z_{Ui}:			
Mean	−0.49	−0.38	−0.56
SD	1.82	1.94	1.92
Skewness	2.54	3.36	3.71
Kurtosis	9.68	19.23	22.05
Kolmogorov test of normality			
D-statistic	0.14**	0.15**	0.15**
Approx. *P*-value	<0.01	<0.01	<0.01

*Significant at the 10% level. **Significant at the 5% level.

stocks, while not statistically significant, are negative (i.e., volatility may have fallen).

Bibliography

Cohen, K. J., Hawawini, G. A., Maier, S. F., Schwartz, R. A., and Whitcomb, D. K. (1983): "Friction in the Trading Process and the Estimation of Systematic Risk," *Journal of Financial Economics,* 12:263–278.

Harris, L. (1989): "S&P 500 Cash Stock Price Volatilities," *Journal of Finance,* 44:1155–1175.

Patell, J. M. (1976): "Corporate Forecasts of Earnings per Share and Stock Price Behavior: Empirical Tests," *Journal of Accounting Research,* 14:246–276.

Pinches, G. E., Mingo, K. A., and Caruthers, J. K. (1973): "The Stability of Financial Patterns in Industrial Organizations," *Journal of Finance,* 28:389–396.