INCREASING BLOCK TRANSACTIONS AND STOCK MARKET BEHAVIOR

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ABSTRACT

An increasing volume of experienced trading tends to reduce autocorrelation and make the market more efficient. Autocorrelation in daily returns changes over time and the changes were less frequent than would be expected if the changes were random, but the changes are random recently. Autocorrelation has a negative connection with rate of return. The relation between autocorrelation and trading volume is positive and nonlinear.

Key words: experience, autocorrelation, block transaction, volume

INTRODUCTION

There is a large literature that shows evidence of deviations of stock return behavior from a simple random walk or from the weak form efficient market hypothesis. For example, Fama (1965) investigates the behavior of the daily closing prices of the 30 Dow Jones Industrials and finds the first-order autocorrelation of daily returns are positive for 23 of the 30 firms, which suggests a positive relationship between successive daily returns. However, the results of his runs tests show that the actual number of runs in four-, nine- and sixteen-day cases are almost identical to what is expected. Lo and MacKinlay (1988) find that weekly returns on portfolios of NYSE stocks show consistent positive autocorrelation, and the autocorrelation is stronger for portfolios of small companies. Similarly, Conrad and Kaul (1988) find that daily and Wednesday-to-Wednesday returns are positively autocorrelated, especially for portfolios of small stocks.

Campbell, Grossman, and Wang (1993) test daily returns on a value-weighted index of stocks on the New York and American Stock Exchanges. They find that first-order autocorrelation tends to decline as volume increases.

In contrast, there is no work relating an increase in the level of investors' experience to stock market behavior. It is possible that, over time, as investors' understanding of financial markets and financial instruments improves, they gain the ability to promptly analyze and rationally use relevant information in forming their trading strategies. In the markets, the number of better-educated and more experienced investors has been growing rapidly over the last few decades. One might expect that this increasing level of investor experience would have an impact on market behavior.

Financial economists generally believe that developed markets are more efficient and less volatile than less developed and emerging markets. However, the comparison is made for similar time periods. Logically, one might ask whether a market becomes more efficient and less volatile as it develops and its

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investors become more experienced. Recently, Gu (2001) and Gu and Finnerty (2002) point out that autocorrelation in the U.S. stock indices exhibits a downward trend over the last twenty-six years.

Further, though many previous studies found significant autocorrelation in stock returns, none has reported that an excess return could be made based on estimated autocorrelation, because of "transaction costs." However, more important reasons may be that actual autocorrelation changes over time or that the changes are random. The estimated autocorrelation would not offer adequate information about dependency in price movements if actual autocorrelation changes over time. The market would still be weak form efficient if the changes are random, because investors cannot forecast the market using the estimated autocorrelation, or, historical autocorrelation patterns provide no information that could be used as the basis for a trading strategy.

In this study, I examine the effects of experienced investors' trading activities, which is approximated by the volume of block transactions, on market behavior. I also look at the relations between rate of return, trading volume, and autocorrelation. I hypothesize that more experienced trading activities tend to make the market more efficient.

The plan of the paper is as follows. Section I describes the data. Section II presents the methodology and the estimated autocorrelation. Section III analyzes the relation between experienced trading activities, return, volume, and autocorrelation. Section IV provides conclusions.

I. THE DATA

It is extremely difficult, if not impossible, to obtain a measure of investors' experience. To approximate advances in investors' experience I use the annual volume of block transaction data that is available from 1965 to 1999. The rapid growth of block transactions indicates the rapid growth of professional trading activities. The daily index of the Dow Jones Industrial Average for the same period is from the Dow Jones Company. The Dow Jones Index has a history of over a hundred years. Its daily data is appropriate for evaluation over a long time frame for the purpose of this study. Stocks in the Dow are generally the most closely watched, the information about them is intensive, and their trading volumes are very large. Hence, the Dow Index is generally regarded as the most efficient portfolio in the world. Also, the Dow Jones Industrial Average Index represents the most well known large stock price index, options and futures on the index started trading on October 6, 1997. Study on the behavior of the index may help investors to develop better investment strategies.

II. THE RUNS TESTS

Runs tests are performed to test autocorrelation between successive daily returns on the Dow Jones Industrial Average Index over the period. The runs test is also used to test the (non)randomness of changes in autocorrelation. The use of a short (daily) horizon may reduce the cost of statistical imprecision. The runs test is a non-parametric test used to detect the frequency of changes in the direction of a time series. As it is a non-parametric test, the runs test is not based on any finite-variance assumption and does not require a normal distribution. Runs are defined here as the number of

sequences of consecutive positive and non-positive (negative or zero) returns. The rate of return is calculated in terms of the difference of their natural logarithms, which gives the continuous compounding rate of return, as below:

$$R_t = \ln P_t - \ln P_{t-1} \qquad (1)$$

where R_t = the rate of return during interval t,

P_t = the value of the index at the end of period t, and

P_{t-1} = the value of the index at the end of period t - 1.

The runs tests tabulate and compare the number of runs in the sample against its sampling distribution under the random walk hypothesis. Suppose that each observation is independently and identically distributed, when the null hypothesis of randomness is true, according to Albright (1987), the mean or expected number of runs can be calculated as

$$E(R) = \frac{N + 2AB}{N} \qquad (2)$$

where N = total number of positive and non-positive sequences in the sample,

A = number of sequences of positive returns in the sample, and

B = number of sequences of negative or zero returns in the sample

The standard error of number of runs can be calculated as

$$SE(R) = \sqrt{\frac{2AB(2AB - N)}{N^2(N-1)}} \qquad (3)$$

To test whether any apparent non-randomness is the result of chance alone, we use the statistic,

$$Z = \frac{R - E(R)}{SE(R)} \qquad (4)$$

where, R = number of actual runs in the sample.

The null hypothesis, H_0 (randomness) can be rejected at the α level if $|z| > \alpha_{z/2}$. The test is a two-tailed test since there is evidence of non-randomness when R is too small or when R is too large. For a two-tailed test with $\alpha = 0.10$, the tabulated z value required is $z_{0.05} = 1.645$, with $\alpha = 0.05$, the tabulated z value required is $z_{0.025} = 1.96$.

Since the runs ratio is defined as the actual number of runs divided by the expected number of runs, it measures the relative departure from randomness. Negative z-values of the runs tests and runs ratios less than unity indicate positive autocorrelation or that price increases or decreases occur in streams. Positive z-values and runs ratios greater than unity indicate negative autocorrelation or that the

index changes directions more frequently than random chance would indicate. A runs ratio equal to unity indicates randomness.

Results of the tests reveal significant autocorrelation for less than half of the 34 years, which is supported by the z-values for the runs tests. In addition, the returns exhibit positive autocorrelation during years with higher autocorrelation, but exhibit negative autocorrelation during years with lower autocorrelation. Table 1 presents the descriptive statistics of the estimated autocorrelation and Figure 1 shows each year's estimated absolute autocorrelation for the period. As shown in the figure, autocorrelation changes every year and autocorrelation from 1965 to 1975 is much higher than from 1976 to 1999.

Table 1

Descriptive Statistics of the Estimated Autocorrelation

Runs ratio is defined as the actual number of runs divided by the expected number of runs. Less-than-unity runs ratios indicate positive autocorrelation or that price increases or decreases in streams.

1965 – 1999	Mean	Stdev.	Maximum	Minimum
Runs Ratio	0.9437	0.0952	0.7677	1.1197
Z(absolute value)	1.3852	1.0787	3.7175	0.0090

Further, the runs test reveals that autocorrelation changes less frequently than would be expected if the changes were random. The z-value of the runs test is negative 2.264, which indicates that autocorrelation increases or decreases in streams during the 34 years. The nonrandom changes in autocorrelation further confirm that the market is not weak form efficient in years with high levels of autocorrelation. However, autocorrelation changes became random recently, which is another indicator that the market gained efficiency.

III. AUTOCORRELATION AND RELATED FACTORS

Regression analysis is conducted to examine the impact of experienced investors' trading activities on autocorrelation and the relations between rate of return, trading volume and autocorrelation. In the model, the absolute value of the estimated runs ratios minus 1 is used as the dependent variable. The absolute value of the dependency measurements can measure the extent of deviation from randomness with the same scale, and reveals both the direction and magnitude of the effects of the independent variables on the level of autocorrelation. The natural logarithm of annual block transaction volume (*lnblktrans*), annual average rate of daily return, and the natural logarithm of annual average of daily trading volume are used as independent variables.

Table 2 presents the results of the regression analyses. There is a significant negative connection between block transaction volume or experienced investors' trading activities and autocorrelation. The negative connection between block transaction and autocorrelation may indicate that more experienced trading activities in general can help to reduce autocorrelation or make the market more efficient.

Investors have gained more knowledge about the stock market since World War II. The number of well-educated financial analysts (MBAs, CFAs, technical analysts and PhDs) has been growing rapidly. Several financial economists have won the Nobel Prize. To further explain the negative connection between investors' experience and autocorrelation, we may use the growth in block transactions as indicators. Block transactions (transactions involving at least 10,000 shares) grew from only 3.1 percent of reported volume on the New York Stock Exchange in 1965 to over 60 percent in 1999[1]. Block traders are mainly institutions. Institutional investors are generally among the most experienced and best-informed market participants. The rapid increase in their holding and trading of stocks indicates a greater proportion of mature trading activities. In the mid-1990s, institutional holdings of stocks crossed the 50 percent threshold. Institutions have highly disciplined analysts, high-powered computers and state-of-the-art trading strategies. Their continuous monitoring of the management of the issuing firms and their (and other matured investors') prompt analysis and rational use of the relevant information in forming trading strategies would reduce information asymmetry. In addition, their attempt to profit from any dependence in successive price changes would reduce the dependency in the price changes. Also, as expected, experienced investors would buy a stock when they identify that the stock is underpriced and sell a stock when they identify that the stock is overpriced. These actions would help to prevent further declines of the underpriced stock and further increases of the overpriced stock, and thus would help to reduce volatility when their actions are correct. Recently, faster, cheaper information and quicker, cheaper execution have lead to an increase in the number of day traders. Successful day traders' speculative trading activities also tend to make price changes more random and less volatile. It is reasonable to expect that experienced investors would take more right actions than wrong ones and that a greater volume of experienced trading activities would have an observable impact on stock market behavior. Figure 1 presents the declining trend of autocorrelation for the period from 1965 to 1999.

Table 2. Estimation Results

This table presents the estimated effect of investors' experience, measured by block transaction (*lnblktrans*) on autocorrelation, and the connection between rate of return, trading volume and autocorrelation.

Dependent		**Independent Variables**			
Variable	**intercept**	***lnblktrans***	***return***	***lnvolume***	Adj. r^2
abs. value	0.1435	-0.0520	-33.3296	0.0558	0.492
of (RR - 1)	(0.954)	(-2.428)**	(-2.162)**	(1.6230)	

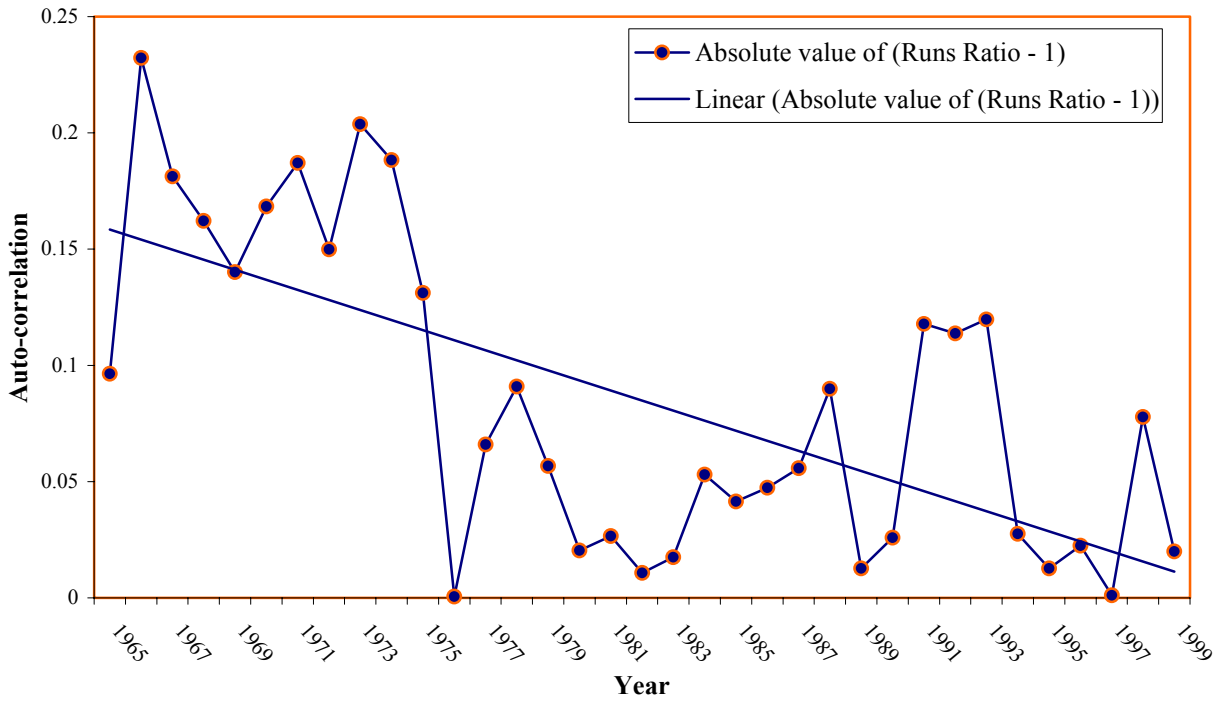
t-value in parenthesis.

** significant at 0.05 level

Rate of return is significantly negatively related to autocorrelation for this data set. The negative relation may occur particularly when autocorrelation is negatively connected to the level of risk and investors' risk aversion. LeBaron (1992) finds that first-order autocorrelations are larger during periods of

lower volatility and smaller during periods of higher volatility for both daily and weekly returns, also, that the relation between volatility and autocorrelation may not be linear. Sentana and Wadhwani (1992) report: “when volatility is low, stock returns at short horizons exhibit positive autocorrelation, but when volatility is rather high, returns exhibit negative auto-correlation." Further tests are needed to reveal the

Figure 1. Estimated Autocorrelation in the Dow



relation between autocorrelation and rate of return.

The insignificant positive relation between volume and autocorrelation shown in this study is inconsistent with what Campbell, Grossman and Wang (1993) have found, but the nonlinearity of the relationship is consistent with what they have found. Such a positive relation could occur under two conditions. First, when professional investors and their clients/advisees take similar actions (in the same direction, such as buy or sell a stock) with short time (daily) lags, then their trading actions would be in streams and increase volume. Since these streams are in the same direction, positive autocorrelation would result. Second, when professional investors and their clients/advisees take actions in the same direction (buy or sell with market orders) with little or no time lag, then there would be overreaction in the market. These overreactions and their corrections would result in high volume and negative autocorrelation. As explained earlier, the absolute value of the estimated autocorrelation is used to reveal the effect of the independent variable, which can indicate that high volume is related to both large positive and large negative autocorrelations under the two conditions.

IV. CONCLUSION

Increasing professional trading activities has had a negative impact on autocorrelation or a positive impact on market efficiency. Autocorrelation between daily returns of the Dow is significant for less than half of the 34 years and autocorrelation fluctuates less frequently than random walk would indicate, but the fluctuation became random recently. In addition, autocorrelation and high trading volume could be positively related under certain conditions and the relation is nonlinear.

Further research is required to reveal how investors' experience and their trading behavior affect market behavior. Data representing advances in investors' experience needs to be explored because block transaction volume can serve only as an approximation for increased experience.

It must be emphasized that the relation between investors' experience and autocorrelation revealed by this study might only indicate one aspect of a historical trend. For example, when financial advisers give the same recommendation to their clients during a short period of time, or professional investors and their clients/advisees take similar actions (in the same direction, such as buy or sell a stock) with short time (daily) lags, the trading actions would be in streams. These streams would result in streams of price changes or positive autocorrelation. Many other factors also affect autocorrelation and volatility. Further tests are required to determine the potential causes for the changes in autocorrelation revealed.

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ENDNOTES

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