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FACTORS AFFECTING TECHNICAL TRADING SYSTEM PROFITS

Scott H. Irwin and B. Wade Brorsen*

Academic researchers have argued about the usefulness of technical trading systems for the past twenty-five years. Attitudes have changed little since Paul Samuelson (1971) claimed, "Technical analysts have holes in their shoes and no record of reproducible worth." Contrary to the prevailing attitude, a growing body of research suggests technical trading systems have been profitable when applied to hedging (Purcell and Fiffe, 1980; Gorman, *et al.*, 1982; Kenyon and Cooper, 1980; Goodman, 1979; Wade, 1984) and speculation (Peterson and Leuthold, 1982; Irwin and Uhrig, 1984; Irwin and Brorsen, 1985a; Brorsen and Irwin, 1985). The previous research concentrated on disproving the notion that trading system profits were on average equal to zero. In the process, researchers also discovered that profits varied considerably through time. In the most recent study, aggregate system returns ranged from a high of 172 percent in 1973 to a low of -26 percent during 1983 (Irwin and Brorsen, 1985a). Technical traders could increase profits if they knew what factors influenced returns. This is particularly important in light of the poor performance of technical systems over 1982 through 1984 (Zaslow and MacKay-Smith, 1984). Analyzing the factors affecting trading system profits will also reveal information concerning the behavior of futures prices over time. The purpose of this paper is to report research relating two factors -- inflation and the amount of technical trading -- to technical trading system returns. Theoretical background is discussed in the next section. Results based on linear

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regression are then presented. The final section presents conclusions based on the regression results.

Theoretical Background

Disequilibrium models of speculative markets are useful starting points for identifying factors affecting trading system profits (Grossman and Stiglitz, 1976; Beja and Hakansson, 1977; Black, 1976; Beja and Goldman, 1980). The basic premise of disequilibrium models is that prices do not adjust instantaneously to supply and demand imbalances. Thus, markets experience short-run periods of disequilibrium where it is profitable for traders to act on price trends signalled by technical trading systems.

Why do markets take time to clear? Arrow and Hahn (1971) and Beja and Hakansson (1977) argued that prices in security markets would not adjust instantaneously because of institutional rigidities such as taxes and transaction costs. Grossman and Stiglitz (1976) stated security prices would never fully adjust because of a noisy information channel, the costs of acquiring and evaluating information and the continuing need to adjust to new information shocks. Black (1976) also suggested that when information arrived in large doses disequilibrium prices would result.

While disequilibrium factors are positively related to trading system profits, the same profits may be limited by the total amount of technical trading in the market. The logic can be traced to efficient market proponents who assert that speculative markets are self-regulating (Malkiel, 1981). If a system is profitable for a period of time, it is doomed to be self-defeating. As more and more traders adopt the profitable system, non-technical traders are likely to learn the workings of the system and buy or sell in anticipation of the technical traders. Thus, system profits will be reduced to zero.

To summarize, markets may experience periods of disequilibrium due to transaction costs, taxes, costs of acquiring and evaluating information and noisy information systems. Disequilibrium conditions create incentives and opportunities for profitable technical trading. However, the profits may be limited by the proportion of traders in a market that use trading systems.

Data and Procedure

The previous theoretical discussion suggests the following model:

- (1) Technical trading = f (Disequilibrium factors, Usage)
system returns

The disequilibrium factors suggested in the theory section are unobservable or difficult to measure. Thus, a proxy variable had to be found which was correlated with disequilibrium conditions in futures markets. Baratz (1984) asserted movements in macroeconomic variables, such as inflation, create conditions favorable to trading systems. Glejser (1965) and Jaffe and Kleiman (1977) have shown the level of inflation to be positively correlated with relative-price variability in a cross-section of countries. Increased variability can distort the information content of relative-prices, leading to disequilibrium conditions. Therefore, the level of inflation was proposed as a measure of disequilibrium conditions in futures markets and the following model specified.

- (2) Technical trading system returns = g (Inflation, Usage)

Even though theory was useful in specifying the variables, it provided little information about the correct functional form. Furthermore, only less-than-perfect data was available. For these reasons we followed Leamer's (1983) suggestion and examined the "fragility" of the estimates by using two functional forms and two different measures of returns to technical trading systems.

The first measure of the dependent variable was the returns from public futures funds whose managers were identified by Irwin and Brorsen (1985b) as relying wholly on technical trading systems. Quarterly returns from 1978 through 1984 were calculated on an aggregate basis:

$$(3) R_j = \left[\frac{\sum_{i=1}^N ((ENAV_{ij} + DIST_{ij}) * BUNIT_{ij})}{\sum_{K=1}^N (BNAV_{Kj} * BUNIT_{Kj})} - 1 \right] * 100.0$$

where R_j is the value-weighted aggregate return in quarter j , $ENAV_{ij}$ is the ending net asset value per unit of fund i in quarter j , $DIST$ is cash distributions, $BUNIT$ is the beginning number of outstanding units, $BNAV$ is the beginning net asset value per unit and N is the number of funds actively traded during the j^{th} quarter.

Futures fund returns have the advantage of representing actual returns to technical trading. Unfortunately, they have two disadvantages. First, the returns are available for only a short period. Second, the returns represent a mix of trading systems which probably changed over time. Because of the disadvantages, a simulated return series generated by Irwin and Brorsen (1985a) was also used as a measure of the dependent variable. The quarterly simulated technical return series covered the 1972 through 1984 period. The technical trading system simulated was the Donchian system, also known as the weekly system. The simulation was based on a set of assumptions which mirrored the operation of a future fund. All returns were net of transaction costs and the result of out-of-sample trading.

The inflation rate was measured by the percent change in the Consumer Price Index. The total dollar equity in technical public futures funds was used as a proxy for the total usage of technical trading systems in U.S.

futures markets. Because the proportion of total trading conducted by technical traders is the variable specified, the total equity in futures funds was "normalized" by dividing by the total open interest in 21 futures markets. The futures fund equity series runs from 1978 through 1984 and thus matches the futures fund return series. Technical trading was assumed to be negligible previous to 1978, thus a zero level of futures fund equity was assumed previous to 1978.

The mean and standard deviation of the basic series are presented in Table 1. Comparing the two technical return series shows average simulated returns were over 11 percentage points higher than those generated by futures funds. In addition, the standard deviation of the simulated returns was over twice that of the funds. Not surprisingly, the mean and standard deviation of the two inflation rate series were not substantially different. The average public futures fund equity over 1978 through 1984 was 195.3 million. The average obscures the growth in equity over the period from \$8.0 to \$310.0 million, a 38-fold increase. However, when adjusted for the growth in futures market open interest, equity increased only by a factor of fifteen.

Results and Analysis

Regression results are reported in Table 2. The R^2 values ranged from .16 to .31, indicating fairly low explanatory power. Inflation rate coefficients were positive and significant in all four models, strongly suggesting technical trading systems were more profitable during periods of high inflation. Results for the measure of trading system usage were inconsistent. The measure had an unexpected positive sign in the actual returns equation (futures funds) and a negative, but insignificant, sign in the simulated return equation. The

Table 1. Mean and Standard Deviation of Basic Data Series

Series	Mean	Standard Deviation
Futures Fund Returns: 1978I - 1984IV (quarterly percent)	2.6	11.7
Simulated Technical Returns: 1972I - 1984IV (quarterly percent)	13.8	24.5
Inflation Rate: 1978I - 1984IV (quarterly percent)	1.9	1.2
Inflation Rate: 1972I - 1984IV (quarterly percent)	1.8	1.0
Futures Fund Equity: 1978I - 1984IV (million dollars)	195.3	132.0

Table 2. Regressions of Technical Trading System Returns Against the Inflation Rate and Measures of Technical Trading System Use.^a

Dependent Variable	Intercept	Inflation Rate	Normalized Futures Fund Equity	Natural Logarithm of Normalized Futures Fund Equity	R ²
Futures Fund Returns (1978I - 1984IV)	-15.68*	6.12*	.140		.25
	(-2.15)	(2.91)	(1.66)		
	-38.19*	6.28*		4.96*	.31
	(-2.58)	(3.29)		(2.17)	
Simulated Returns (1972I - 1984IV)	-1.26	9.18*	-.707		.16
	(-.16)	(2.72)	(-.67)		
	1.38	9.66*		-1.68	.19
	(.19)	(3.02)		(-1.59)	

^a Asterisks denote significance at the 5 percent level using a two-tailed t-test. Values in parentheses are t-values.

unexpected results may be due to measurement problems. Future fund equity may be a poor proxy for the usage of technical trading systems.

In spite of the possible data problems, all of the estimated equations suggested high inflation periods were favorable to technical trading systems. This provides further validity to disequilibrium models as descriptions of short-run futures price behavior. Knowledge of the relationship of technical returns to inflation may help traders increase profits by decreasing or stopping system trading during low inflation periods and increasing system trading during high inflation periods.

The results did not indicate system traders should greatly fear the recent increases in system usage. Two cautions are necessary, though. First, the simulated equations (which showed a negative relationship) may be more reliable since the simulated returns represented a longer time period and a consistent trading method. Second, the self-regulating component of efficient market theory is still appealing, especially in view of the lack of precision employed in measuring the amount of system trading.

Summary and Conclusions

This paper sought to explain the wide variation in technical trading system profits over time. Two factors were used to explain profits, the inflation rate and the relative amount of systems trading. The procedure used was to regress returns to system trading against inflation and a measure of trading activity. Both actual and simulated returns were used. The simulated returns may be more relevant since they had a longer observation period and used a consistent trading method. Futures fund equity in relation to open interest was used as the measure of trading activity.

The results showed a strong positive association between inflation and both sets of technical returns, suggesting disequilibrium conditions create price dependencies which can be exploited by trading systems. It also indicates traders may expect lower returns during periods of low inflation and may partially explain the recent decrease in returns to technical trading. Weak and inconsistent results were found with respect to the measure of technical system usage. However, such results may have more to do with measurement problems than incorrect theory.

The research presented in this paper was meant to be more illustrative than definitive. We hope the paper will stimulate further theoretical and empirical research which will more rigorously explain the dynamics of technical trading returns. Such research will be important simply due to the pervasive use of trading systems by both speculators and hedgers in futures markets.

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