DID THE GOOD GUYS LOSE? HETEROGENEOUS TRADERS AND REGULATORY RESTRICTIONS ON DUAL TRADING

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ABSTRACT

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We study the effect of restrictions on dual trading in futures contracts. Previous studies have found that dual trading restrictions can have a positive, negative, or neutral effect on market liquidity. In this paper, we propose that trader heterogeneity may explain these conflicting empirical results. We find that, for contracts affected by restrictions, the change in market activity following restrictions differs between contracts. More important, the effect of a restriction varies among dual traders in the same market. For example, dual traders who ceased trading the S&P 500 index futures following restrictions had the highest personal trading skills prior to restrictions. However, realized bid-ask spreads for customers did not increase following restrictions. Our results imply that securities regulation may adversely affect customers, but in ways not captured by broad-based liquidity measures, such as the bid-ask spread.

1. Introduction and Background

Dual trading is the practice whereby floor traders on a futures exchange execute trades for their proprietary accounts and customers on the same day. There is considerable confusion in academic as well as policy circles regarding the desirability of dual trading. Proponents of dual trading believe it enhances market liquidity; opponents emphasize the possibility of trading abuse. The empirical evidence is equally confusing. Depending on the market studied, the correlation between dual trading and liquidity may be negative, positive or zero (Fishman and Longstaff 1992, Smith and Whaley 1994, Chang and Locke 1996.) It is, perhaps, natural that, given the lack of clear results, policy makers have chosen to emphasize the potential for trading abuse when dual trading occurs. In 1992, the U.S. Congress passed the Futures Trading Practice Act, which, among other things, compelled the CFTC to pass regulations to prohibit dual trading on high volume contracts.[1]

In this research, we seek to explain the conflicting empirical results surrounding dual trading. We propose that floor traders in general, and dual traders in particular, are heterogenous with respect to trading and execution skills. Our approach is motivated by two strands of the existing theoretical literature on dual trading.[2] In one strand, dual traders are modeled as skilled brokers and market makers, whose existence contributes a potentially positive effect on liquidity (Grossman, 1989). In the other strand of literature, dual traders are viewed as informationally-motivated traders, with a potentially negative effect on liquidity (Fishman and Longstaff, 1992; Roell, 1990; Sarkar, 1995).[3] In markets with a relatively high proportion of skilled dual traders, a restriction on dual trading may harm liquidity. In markets with a relatively low proportion of skilled dual traders and a relatively high proportion of

informationally-motivated dual traders, there may be a zero or negative correlation between dual trading and market liquidity.[4] It is likely that each futures pit contains a different mix of dual traders, and is affected differently by the same dual trading restriction. Thus, trader heterogeneity could potentially explain the conflicting empirical results surrounding dual trading.

We examine two particular episodes of dual trading restrictions: the Chicago Mercantile Exchange's (CME) top-step rule[5], which restricted dual trading in the S&P index futures after June 21, 1987; and rule 552[6], which the CME imposed on dual traders in high volume contracts in 1990. To study the effects of rule 552, we examine the Japanese Yen futures contract.[7] The wording of the two rules (top-step and 552) appears different, but their effect on dual trading is similar. The top-step rule specifically bans dual trading only on the top-step of the pit, whereas rule 552 bans dual trading in all active contracts. However, the geography of the pit dictates that brokers stand on the top step of the pit to maintain sight contact with their clerks and the trading desk. By banning personal trading on the top step, the top-step rule severely constrains brokers from dual trading.

The main steps of our analysis are as follows. First, we document the occupational choice of dual traders following restrictions (eg., whether a dual trader became a pure broker following restrictions). Next, we group dual traders prior to restrictions according to their observed occupational choice following restrictions (e.g., one group consists of those dual traders in the pre-restriction period who chose to become pure brokers following restrictions). We establish heterogeneity between these groups of dual traders with respect to their pre-restriction trading patters, as well as their trading and executions skills. Finally, we examine

whether customers in the aggregate are hurt by dual trading restrictions.

Our empirical results document the existence of heterogeneity among dual traders, and demonstrate that dual trading restrictions affect different groups of dual traders in the same market differently. For example, the group of dual traders who chose to become pure brokers (locals[8]) following restrictions was primarily engaged in trading for customers (their own accounts) prior to restrictions. In addition, for the S&P 500 futures, dual traders with the highest personal trading skills quit trading this contract following restrictions. However, the exit of highly skilled traders did not increase customers' trading costs following restrictions. Two possible reasons are: one, execution skills required for personal trading are not highly correlated with execution skills required for customer orders. Two, we find evidence that, for the S&P 500, dual traders with the highest customer order execution skills chose to become pure brokers following restrictions.

For regulatory policy, an implication of our results is that restrictions on dual trading are difficult to justify on the basis of economic arguments. The effect of restrictions on the market is at best neutral, with side effects that are potentially negative for customers. Broad-based measures of liquidity (such as the bid-ask spread), used in previous studies, fail to capture these side effects of regulation. For the contracts we study, this harmful side effect may arise from customers being deprived of the services of the most skilled traders. In our study, this has no apparent adverse effect on customers' trading costs--but, for other contracts, a different outcome could occur. Perhaps, concerns about trading abuses are best countered by increasing competition among brokers[9], and a better technology for recording trades, not by restricting dual trading.

As mentioned earlier, the empirical evidence on the efficacy of dual trading restrictions is mixed and confusing. The Commodity Futures Trading Commission (CFTC) (1989) finds no evidence of superior trading skills for dual traders, in a variety of markets. Dual traders appear to supply liquidity with their personal trading, but their personal trading is no more important than traders who are exclusive proprietary traders. Fishman and Longstaff (1992) find some evidence that customers of dual traders have higher trading profits (lower trading costs) compared to customers of pure brokers. Chang and Locke (1996) find that dual traders are specialized, concentrating either on brokering or personal trading. Dual traders do not earn as much with their personal trading as do exclusive personal traders. They have mixed results on whether their customers have lower trading costs compared to customers of pure brokers.

In addition to skill levels, the literature discusses the effect of dual trading on liquidity. Smith and Whaley (1994) and Walsh and Dinehart (1991) find some evidence consistent with the notion that the practice of dual trading increases liquidity. Smith and Whaley (1994) base their findings on a particular bid ask spread estimator, which, Locke and Venkatesh (1996) show bears little relation to actual customer transactions costs. Chang and Locke (1996) find that a restriction on dual trading has a positive effect on liquidity.

The existing theoretical literature on dual trading focuses on two different aspects of dual trading. Grossman (1989) asserts that dual traders are superior at order execution and market making. Also, dual traders provide flexibility by reacting quickly to changing market conditions, absorbing excess order flow, or racing to fill customer orders. By competing with both pure brokers and market makers (at least in the short run), dual traders enhance market

liquidity. Fishman and Longstaff (1992), on the other hand, model dual traders as mimicking the trading decisions of informationally-motivated traders and reducing trading profits of informed traders. Roell (1990) and Sarkar (1995) show that dual traders may also hurt uninformed traders and, as a consequence, liquidity may decrease.

The rest of the paper is organized as follows. Section two describes the data and our procedure for identifying various floor trader groups. In section three, we describe the effect of restrictions on market activity. Section four documents the occupational choice of dual traders following restrictions. In section five, we estimate relative execution skills of dual traders prior to restrictions and the effect of restrictions on customer trading costs. Section six concludes.

2. Data and Sample Descriptions

The Computerized Trade Reconstruction (CTR) data is used in this study for two futures contracts which trade on the CME, the S&P 500 index and the Japanese Yen. The data were generously supplied by the CFTC, and consist of detailed records for every transaction on the floor of the exchange. For each transaction, the record contains the customer type, the trade type, the broker's identification number, the number of contracts traded, the buy-sell indicator and the price. Most relevant, there are four different customer types for each trade by each floor trader: trading for their own account, trading for their clearing members' house account, trading for another member present on the exchange floor, and trading for any other type of customer. For our purpose, only those trades related to dual trading, that is, trades executed

for the trader's own account and for customers, are included in the sample.

We use a three-month window to examine the effect of the CME's rules. The sample period covers May 1 through July 31, 1987 for the S&P 500 index futures contract with the top-step rule effective from June 22. For the Yen, the sample period covers April 1 through June 28, 1991, with the rule banning dual trading effective from May 20. The pre- and post-rule samples are defined according to the event date from which the rule was imposed. For both contracts, there are 35 days in the pre-rule sample and 29 days in the post-rule sample.[10]

To identify dual and other traders, we first calculate a trading ratio for each floor trader for each day she is active. Specifically, define d = (personal trading volume)/(personal trading volume + customer trading volume), the proportion that personal trading volume is of a floor trader's total trading volume on a day. For a floor trader, define a trading day as a local day if $d>0.98$, a broker day if $d<0.02$ and a dual day if d lies on the closed interval $[0.02, 0.98]$.[11]

Based on these daily floor trader observations, we form several subsamples on which to perform analysis. Initially, we divide floor traders into a pre-rule and a post-rule sample. Floor traders are categorized as dual traders, pure brokers or locals for each of the two samples separately. A floor trader with *at least* one dual day in the sample is defined as a dual trader. A floor trader with only local (broker) days in the sample is defined as a local (pure broker). Since we intend to test for heterogeneity among dual traders, the dual trader sample in the pre-rule period is split into four subsamples based on the observed occupational choice of dual traders following restrictions. The four occupational choices are: to become a

pure broker, local, or dual trader; or to quit trading in the affected commodity. For example, one subsample consists of those dual traders who became pure brokers following restrictions.

3. Trading Activity Before and After Dual Trading Restrictions.

3. a. Floor Trader Activity Before and After Dual Trading Restrictions

In this section, we describe the activity of floor traders in the two markets before and after restrictions. These preliminary statistics offer some interesting contrasts between the floor trader groups in the two futures pits. The number and activity level of dual traders were reduced in both pits following restrictions. However, dual traders in the Yen pit spent less time dual trading prior to restrictions and were affected more adversely following restrictions. Following restrictions, activity by brokers and locals increased in the S&P 500 pit, and decreased in the Yen pit.

The top half of table 1 contains summary statistics for the activities of floor traders in the S&P 500 index futures. In the pre-rule period, there were 390 floor traders active on a given day[12], consisting of 210 locals, 26 pure brokers and 154 dual traders[13]. Following the top-step rule, the number of active floor traders increased while the number of active dual traders dropped slightly[14], indicating that increased nondual trading more than offset the fall in trading of dual traders. Also, in the pre-rule period, the average dual trader was more active than the average floor trader, trading for more than 21 days out of the 35 sample days. Almost 13 of these 21 days were spent dual trading, and 6 of 8 other days trading for their own account. By contrast, following restrictions, the average dual trader spent just 5 of 21 active days dual trading, with the other days split almost equally between trading for

customers and trading for their own account.

The lower half of table 1 contains similar statistics for the Yen. There were 108 active floor traders in the pre-rule period, consisting of 53 locals, 17 pure brokers and 38 dual traders. Following restrictions, the number of active floor traders fell. The number of active dual traders[15] also fell, and more sharply compared to the S&P 500 futures. Similar to the S&P 500 futures, dual traders were more active than nondual traders in the pre-rule period. However, by comparison to the S&P 500 futures, dual traders in the Yen pit spent relatively less time dual trading prior to the ban and traded mostly for customers following the ban.

3. b. Dual and Nondual Trading Days Before and After Dual Trading Restrictions.

This section evaluates the typical daily trading of a floor trader. We combine local days, broker days, and dual days, independent of the classification of the trader based on their cumulative trading. These summary statistics are shown in table 2. For both contracts, dual trading days accounted for a significant portion of pit activity, especially for customer trades. The restrictions led to a sharp decline in the amount of trading activity occurring on dual trading days.

Statistics for the S&P 500 are presented in the upper half of table 2. There were more than 3.45 million contracts traded and 13,667 trader-days in the pre-rule period. Dual trading days accounted for about 23% of all trader days, 45% of all trades and 47% of total trading volume. 72% of all customer volume was executed by dual traders when they were dual trading. Following the implementation of the top-step rule, only 8% of trader days, 12% of trades and less than 12% of trading volume occurred on dual trading days. Customer trades

on dual trading days fell sharply. As a result, the average number of daily trades and average trading volume for customers fell from their pre-rule levels.

The lower half of table 2 shows statistics for the Japanese Yen. Almost 1.25 million contracts were traded and there were 3,775 trader days in the pre-rule period. Relative to the S&P 500, dual trading days were not a dominant part of total market activities prior to the ban. Dual trading days accounted for 15% of trader days, 23% of trades and 25% of trading volume. However, dual trading days still accounted for 41% of all customer trading volume. Following restrictions, dual trading days accounted for 6% or less of total trader days, number of trades or trading volume.

4. Occupational Choice of Dual Traders Following Restrictions

4. a. Floor Trader Transition

In this section we follow dual traders in the respective markets from their behavior in the pre-restriction period to their choice of occupation in the post-restriction period. A dual trader has four possible reactions to the restrictions. First, they could continue to dual trade according to the CME's rules. As stated above, traders may still maintain an error account, whose trades appear identical to proprietary trading in the data set. This error account trading, combined with customer trading, will appear to be dual trading. Also, they may dual trade if they are not on the top step of the S&P 500, or if they switch from trading as a broker to trading as a local once a day in the Japanese Yen pit. Second, they could become locals. Third, they could become exclusive brokers. Fourth, they may simply exit the particular contract which is subject to the restriction.

Panel A of table 3 reports this transition matrix for all floor traders around the implementations of the respective restrictions. For our analysis, the most important numbers are those which lie on the diagonal of the matrix. These indicate the number of floor traders who continue in their original occupations following restrictions. For the S&P 500, 25% of pure brokers, 67% of locals and 61% of dual traders continue in their original occupation after restrictions. The corresponding numbers for the Yen are 36%, 62% and 58% respectively.

Many traders, especially pure brokers, traded only once during our pre-rule sample period. To get a clearer picture of traders' choice, we report, in panel B of table 3, the transition matrix for relatively active floor traders (defined as those who traded on at least 2 days during the pre-rule sample period). For the S&P 500, 69% of pure brokers, 79% of locals and 64% of dual traders continue in their original occupations after restrictions. The corresponding numbers for the Yen are 68%, 86% and 63% respectively. Since we categorize a floor trader as a dual trader if she traded just for one day in the 29 days following restrictions, whereas brokers (locals) must trade for customers (themselves) every day, these numbers are strong evidence that dual traders' occupational choice was primarily influenced by restrictions.

A surprising result is the large number of floor traders who quit trading in their home pit. Panel A of table 3 shows that, for the S&P 500, more than 70% of pure brokers, almost 25% of locals and 8% of dual traders were no longer active in the affected contract market for the 29 trading days following the top-step rule. For the Yen, the corresponding numbers are 63%, 36% and 12%, respectively. Since the normal attrition rate is 10% or less per month for floor traders in CME futures pits[16], the reported attrition rate for pure brokers and locals

here appears very high. Of floor traders switching occupations but not quitting, the primary migration involves dual traders and brokers becoming locals.

Panel B of table 3, however, shows that the percent of discontinuing traders falls dramatically for active floor traders, although (except for dual traders) the number is still higher than the "normal" cutoff of 10%. For the S&P 500, 20% of pure brokers, 13% of locals and 4% of dual traders were no longer active in their home pit following the top-step rule. For the Yen, the corresponding numbers are 29%, 12% and 6%, respectively[17].

4.b. Relative Trading Behavior of Dual Traders Prior to Restrictions

Table 4 shows summary trading statistics for separate categories of dual traders, distinguished by their activity in the post-restriction period. Dual-locals (dual-brokers) are those traders who were classified as dual traders in the pre-restriction period and chose to execute exclusively personal (customer) trades in the post-restriction period. Dual-quitters are those floor traders who were dual traders in the pre-restriction period and failed to trade in the affected contract in the post-restriction period.

For both contracts, dual-brokers were predominantly involved in trading for their customers on all their days in the pre-rule period. For example, in the S&P 500, dual-brokers had only 24 local days out of 259 trader days. On their dual trading days, they traded on average only 116.25 contracts for their own accounts, but 588.68 contracts for customers. Similarly, for both contracts, dual-locals were almost entirely involved in trading for their own accounts on all their days prior to the top-step rule. We observe a different trading pattern for dual-quitters. In the S&P 500, they were primarily locals when they were not dual

trading, but mostly traded for customers on their dual days. In the Yen pit, discontinuing dual traders traded mainly for customers on both their dual and nondual trading days.

The results in this section establish both the heterogeneity of dual traders in each market, as well as the differential effect of restrictions on each type of dual trader. The evidence here reveals that dual traders are heterogenous with respect to their trading patterns. In section 5, we establish dual traders' heterogeneity with respect to their trading and execution skills.

5. Relative Skill Levels of Dual Traders Before Restrictions

5.a. Dual Traders' Personal Trading Skills

When dual trading becomes more costly, dual traders who are relatively skilled at trading may trade only for their own accounts following restrictions while those who are relatively less skilled may trade only for customers. Dual-quitters may be more or less skilled compared to the average dual trader. We use the group of dual traders who dual trade for at least one day in the 29 days following restrictions (referred to as "dual-duals") as the benchmark group and compare their per contract median revenues with those of the other three groups (i.e. those who switched to being locals or brokers, or quit). Since higher dual trader revenues may be due to better information (obtained from their customers' trades) rather than skill, the comparisons are made only for local days of dual traders prior to dual trading restrictions.

Aggregate trading revenues for each dual trader are computed on a daily basis. For each trader, and for each day, the value of purchases is subtracted from the value of sales, with imbalances valued at the daily settlement price (marked-to-market). Daily revenues are then

divided by the number of round-trip transactions for each floor trader, to obtain daily revenues per contract.

Table 5 reports personal trading revenues of different groups of dual traders on their local days prior to dual trading restrictions. The Wilcoxon Z statistic is used to test the null hypothesis that the distribution of personal trading revenues of each dual trading group is no different than that of dual-duals. Given the liquidity of these contracts, we expect per contract revenues to be $25 (the minimum tick), or less. When the number of observations (number of trader days) in a group is relatively small, however, our calculated median revenue values are much higher than $25. This observation is particularly valid for dual-brokers in the Yen pit, for which we have only two observations.

For both contracts, table 5 shows that dual-duals have close to the lowest median revenues of the four groups. In the S&P 500, dual-duals had significantly lower per contract revenues compared to the dual-quitters. Their median revenues are lower by a cash equivalent value of $20.50 per contract, or about 80% of the minimum tick of $25. For the Yen, there are no significant differences between the median revenues of different groups of dual traders[18]. These results suggest that, at least for the S&P 500, restrictions hurt relatively skilled dual traders more than dual traders of average skill.

5.b. Dual Traders' Execution Skills

Similar to personal trading revenues, execution skills may be compared by calculating average round-trip costs for customers. Assuming that floor traders are executing orders from the same broad set of customers, any differences in trading costs for these customers across

floor traders can be attributed to the execution skills of the traders.[19] The customer costs are calculated each day for each trader for all customer trades executed by that trader. Customer costs per contract are computed as the volume weighted average buy price for each customer minus the volume weighted average sale price (i.e., it is the opposite of customer profits). Several comparisons are performed both within each group and across groups.

Table 6 reports the statistics for customer order execution costs. The upper panel presents the results for the S&P 500, and the lower panel presents results for the Japanese Yen. For each commodity, within each group, customer costs are compared on the group's dual trading and pure broker days. If dual traders are profiting from observing the trading of their informed customers, then on days when these traders dual trade, their (informed) customer costs will likely be lower than on days when the trader is only brokering. In other words, the trader has an option on when to trade for her own account, and may be exercising this option when her informed customers are trading. A Wilcoxon z statistic is calculated using the trader day as the basic observation unit.

The test for the equality of customer costs[20] on dual vs. broker days for each group is presented in the third row of each panel, labeled 'Dual vs. Broker Days'. Only for the S&P 500 contract, for the dual-broker category, is the Wilcoxon z statistic even marginally significant. And, for this contract, customer costs are <u>higher</u> on dual trading days--the opposite of what should happen if dual traders' trades were informationally motivated. These results suggest that execution skill levels, rather than information, will be the source of any differences across groups.

In addition, and more related to our argument, each group's customer costs are compared

to each of the other groups using only the broker days. The Wilcoxon z statistic is calculated to test the hypothesis that the respective dual trading group's customer execution skill is no different than that of other dual trading groups. These statistics are presented in the bottom three rows of each panel. For the S&P 500, two patterns stand out. First, customers of dual-brokers had lower costs than the other groups. These costs are significantly lower than those for customers of dual-duals (at the 5% level) and customers of dual-locals (at the 10% level). The result indicates that customers did not lose the services of skilled brokers following restrictions. Second, customers of dual-duals had the highest trading costs among the four dual trader groups. Although the differences in costs are not significant, the result is consistent with our earlier finding that restrictions affected relatively skilled dual traders in the S&P 500 contract.

For the Japanese Yen contract, customers of dual-quitters had the highest execution costs among all four dual trader groups. These costs are significantly higher (at the 5% level) compared to customers of dual-locals. In fact, for both contracts, customers of dual-quitters had the highest trading costs--with the exception of customers of dual-duals in the S&P 500. These results suggest that dual-quitters were informationally motivated traders. Once the information source (customers) disappeared (due to restrictions), their trading motive disappeared too.

The results in this section provide evidence of differences in execution skills between different dual trader groups. In particular, dual traders in the S&P 500 who became pure brokers following restrictions had superior execution skills compared to two of the other three dual trader groups. Dual traders in the Japanese Yen who quit trading following restrictions

had inferior execution skills compared to one of the other dual trader group. Both these results constitute good news for customers, and have implications for the effect of the restrictions on customer trading costs.

5.c. The Effect of Dual Trading Restrictions on Overall Customer Costs

In this section we examine the overall effect of dual trading restrictions on customer costs. We combine all customer trading for all groups, and calculate customer costs similar to the procedure described in section 5.b.. These costs are calculated on a daily basis for each day in the sample, both before and after the dual trading restrictions. To estimate the effect of the restriction on customer costs, the following regression is estimated:

$$S_t = a_0 + a_1 V_t + a_2 VOL_t + a_3 M_t + a_4 D_t + e_t$$

where, for day t, S_t is the measure of customer trading costs (average buy price minus average sale price) in dollars, V_t is customer trading volume, VOL_t is the standard deviation of buy prices for customer trades, M_t is the number of floor traders trading for their own account, and D_t = 1 in the pre-rule periods and 0 otherwise. T-statistics are shown in parentheses. N is the number of observations. This analysis parallels Smith and Whaley (1994) and Chang and Locke (1996).

If the restriction of dual trading increases customer costs, then a_4 will be less than zero. Increased competition between floor traders should reduce customer costs, so we expect a_3 to be negative. a_1 and a_2 are expected to be positive, since customer costs tend to increase with

volume and volatility. Results are presented in table 7. For neither contract is the coefficient a_4 significantly different from zero, indicating that customer costs were unaffected by restrictions for both contracts. The other explanatory variables, with the exceptions of volatility and volume (for the S&P 500), are insignificant. The coefficient on volatility is positive and significant, as would be expected if marketmakers widen the bid-ask spread when price volatility increases.

6. Conclusion

Our aim was to show that trader heterogeneity can explain the conflicting empirical results surrounding dual trading. Overall, the results confirm that there exists heterogeneity of trader types on futures exchanges, so that regulatory restrictions such as a dual trading ban may have disparate effects on different trader groups, and possibly unintended consequences for customers. Those dual traders who discontinued dual trading in the S&P 500 index futures had, on average, higher execution skills for both their personal and customer trading. For example, dual traders who ceased trading the S&P 500 index futures had the highest personal trading skills. However, on the whole, customers' transaction costs did not increase in the S&P 500 following the introduction of the top-step rule. This may have been because dual traders most skilled in executing for customers became exclusive brokers following the restriction.

Our findings for the Japanese Yen are less pronounced. There is some evidence that dual traders who quit trading the Japanese Yen had relatively poor customer execution skills. Again, following the restriction customer transaction costs did not increase--perhaps because,

in this contract, the restriction did not appear to have hurt relatively skilled dual traders more.

These results suggest that broad based measures, such as the bid-ask spread, or contract volume, are not necessarily sufficient to capture the effects of microstructure regulation. The seemingly divergent results in the dual trading literature may be due to the fact that the complexity of futures markets is more than allowed for by the typical microstructure models.

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Table 1
Activity by Floor Trader Types
S&P 500 and Japanese Yen Futures

Locals (brokers) refers to floor traders who traded exclusively for their own (customers) account during the sample period. Dual traders refers to floor traders who traded both for their own and their customers' accounts on the same day at least once during the sample period. There are 35 days before and 29 days after the dual trading restrictions for both contracts. The sample periods are May 1 to July 31, 1987 for the S&P 500 futures and April 1 to June 28, 1991 for the Japanese Yen futures.

	Locals		Brokers		Dual Traders		All	
Number of:	Before	After	Before	After	Before	After	Before	After
				S&P 500				
Traders	484	477	205	176	252	197	941	850
Trading days:	7,339	7,426	912	1,025	5,416	4,268	13,667	12,719
own account only	7,339	7,426	—	—	1,595	1,563	8,934	8,989
customer only	—	—	912	1,025	648	1,668	1,560	2,693
dual	—	—	—	—	3,173	1,037	3,173	1,037
Active days per trader:	15.16	15.57	4.45	5.82	21.49	21.66	14.52	14.96
own account only	15.16	15.57	—	—	6.33	7.93	9.49	10.58
customer only	—	—	4.45	5.82	2.57	8.47	1.66	3.17
dual	—	—	—	—	12.59	5.26	3.37	1.22
Active traders per day:	209.69	256.07	26.06	35.34	154.74	147.17	390.49	438.59
own account only	209.69	256.07	—	—	45.57	53.9	255.26	309.97
customer only	—	—	26.06	35.34	18.51	57.52	44.57	92.86
dual	—	—	—	—	90.66	35.76	90.66	35.76
				Japanese Yen				
Traders	129	116	106	81	53	35	288	232
Trading days:	1,867	1,310	588	403	1,320	767	3,775	2,480
own account only	1,867	1,310	—	—	374	507	2,241	1,817
customer only	—	—	588	403	383	125	971	528
dual	—	—	—	—	563	135	563	135
Active days per trader:	14.47	11.29	5.55	4.98	24.91	21.91	13.11	10.69
own account only	14.47	11.29	—	—	7.06	14.49	7.78	7.83
customer only	—	—	5.55	4.98	7.23	3.57	3.37	2.28
dual	—	—	—	—	10.62	3.86	1.95	0.58
Active traders per day:	53.34	45.17	16.8	13.9	37.71	26.45	107.86	85.52
own account only	53.34	45.17	—	—	10.69	17.48	64.03	62.66
customer only	—	—	16.8	13.9	10.94	4.31	27.74	18.21
dual	—	—	—	—	16.09	4.66	16.09	4.66

Table 2
Activity By Trading Day Type
S&P 500 and Japanese Yen Futures

Local days (broker days) refers to trading days on which floor traders traded exclusively for their own (customers') accounts. Dual trading days refers to trading days on which floor traders traded both for their own accounts and for their customers. There are 35 days before and 29 days after the dual trading restrictions for both contracts. The sample periods are May 1 to July 31, 1987 for the S&P 500 and April 1 to June 28, 1991 for the Japanese Yen.

	Local Days		Broker Days		Dual Trading Days		All	
Number of	Before	After	Before	After	Before	After	Before	After
				S&P 500				
Trader days	8,934	8,989	1,560	2,693	3,173	1,037	13,667	12,719
Transactions	483,428	513,677	84,176	274,441	458,283	107,892	1,025,887	896,010
Contract volume	1,396,106	1,474,505	425,652	936,266	1,632,196	324,375	3,453,954	2,735,146
Average daily trades:	54.11	57.15	53.96	101.91	144.43	104.04	75.06	70.45
own account	54.11	57.15	—	—	42.76	39.78	45.3	43.63
customer	—	—	53.96	101.91	101.67	64.26	29.76	26.82
Average daily volume:	156.27	164.03	272.85	347.67	514.4	312.8	252.72	215.04
own account	156.27	164.03	—	—	169.58	118.54	141.52	125.59
customer	—	—	272.85	347.67	344.83	194.26	111.2	89.45
Average trade size:	2.89	2.87	5.06	3.41	3.56	3.01	3.37	3.05
own account	2.89	2.87	—	—	3.97	2.98	3.12	2.88
customer	—	—	5.06	3.41	3.39	3.02	3.74	3.34
				Japanese Yen				
Trader days	2,241	1,435	971	910	563	135	3,775	2,480
Transactions	128,910	64,407	65,298	49,215	59,399	7,261	253,607	120,883
Contract volume	558,528	297,661	374,240	339,488	309,749	36,166	1,242,517	673,315
Average daily trades:	57.52	44.88	67.25	54.08	105.5	53.79	67.18	48.74
own account	57.52	44.88	—	—	25.86	11.59	38.01	26.6
customer	—	—	67.25	54.08	79.64	42.2	29.18	22.14
Average daily volume	249.23	207.43	385.42	373.06	550.18	267.9	329.14	271.5
own account	249.23	207.43	—	—	83.68	43.11	160.43	122.37
customer	—	—	385.42	373.06	466.01	224.79	168.71	149.13
Average trade size	4.33	4.62	5.73	6.9	5.21	4.98	4.9	5.57
own account	4.33	4.62	—	—	3.24	3.72	4.22	4.6
customer	—	—	5.73	6.9	5.85	5.33	5.78	6.74

Table 3
Floor Trader Transition
S&P 500 and Japanese Yen Futures

Floor traders are classified in a 35 day period before and a 29 day period after dual trading restrictions by their personal trading volume as a percentage of the sum of their customer and personal trading volumes for trading days over the period. 8 of the active floor traders in the S&P 500 futures and 1 active floor trader in the Japanese Yen were dual traders before the restrictions, but traded as pure brokers on some days and as locals on other days following the restrictions. All of these traders are omitted from the sample. Active floor traders, used exclusively for the lower panel, are those who traded on at least two days in the pre-restriction period. The sample periods are May 1 to July 31, 1987 for the S&P 500 and April 1 to June 28, 1991 for the Japanese Yen.

	Post-restriction choice for all floor traders				
Pre-restriction choice	Pure broker	Local	Dual trader	Discontinued	Pre-restriction total
			S&P 500		
Pure broker	52	8	5	140	205
Local	7	325	36	116	484
Dual trader	14	61	149	20	244
Post-restriction total	73	394	190	276	933
			Japanese Yen		
Pure broker	38	0	1	67	106
Local	1	80	2	46	129
Dual trader	4	12	30	6	52
Post-restriction total	43	92	33	119	287
	Post-restriction choice for active floor traders				
Pre-restriction choice	Pure broker	Local	Dual trader	Discontinued	Pre-restriction total
			S&P 500		
Pure broker	31	1	4	9	45
Local	0	305	32	51	388
Dual trader	14	61	149	10	234
Post-restriction total	45	367	185	70	667
			Japanese Yen		
Pure broker	23	0	1	10	34
Local	0	71	2	10	83
Dual trader	4	11	30	3	48
Post-restriction total	27	82	33	23	165

Table 4
Activity of Dual Traders who Changed Occupations or Quit S&P 500 and Japanese Yen Futures

Dual-brokers (dual-locals) are floor traders who were classified as dual traders before the restrictions but switched to trading only for their customers'(personal) accounts following the restrictions. Discontinued-dual are floor traders who were classified as dual traders before the restrictions but quit trading in the affected contract or contract month afterwards. The sample periods are May 1 to July 31, 1987 for the S&P 500 and April 1 to June 28, 1991 for the Japanese Yen.

	Dual-brokers				Dual-locals				Dual-quitters		
		Before		After		Before		After		Before	
Trader Day Type	Local	Broker	Dual	Broker	Local	Broker	Dual	Local	Local	Broker	Dual
					S&P 500						
Trader days	24	102	135	204	892	31	352	1,075	146	13	107
Transactions	127	6,318	18,798	18,108	57,347	567	36,062	59,433	5,805	234	9,582
Contract Volume	345	32,344	95,166	72,260	165,705	1,786	151,524	166,580	17,685	1,701	23,963
Average daily trades:	5.29	61.94	139.24	88.76	64.29	18.29	102.45	55.29	39.76	18	89.55
own account	5.29	—	18.96	—	64.29	—	55.16	55.29	39.76	—	35.93
customer	—	61.94	120.29	88.76	—	18.29	47.29	—	—	18	53.62
Average daily volume:	14.38	317.1	704.93	354.22	185.77	57.61	430.47	154.96	121.13	130.85	223.95
own account	14.38	—	116.25	—	185.77	—	233.69	154.96	121.13	—	82.76
customer	—	317.1	588.68	354.22	—	57.61	196.78	—	—	130.85	141.2
Average trade size:	2.72	5.12	5.06	3.99	2.89	3.15	4.2	2.8	3.05	7.27	2.5
own account	2.72	—	6.13	—	2.89	—	4.24	2.8	3.05	—	2.3
customer	—	5.12	4.89	3.99	—	3.15	4.16	—	—	7.27	2.63
					Japanese Yen						
Trader days	2	42	10	25	262	8	45	185	10	10	19
Transactions	31	6,550	760	2,196	17,070	31	3,163	8,278	110	515	1,112
Contact volume	59	69,635	7,303	28,661	73,002	254	10,734	32,873	200	2,936	6,014
Average daily trades:	15.5	155.95	76	87.84	65.15	3.88	70.29	44.75	11	51.5	58.53
own account	15.5	—	8.6	—	65.15	—	62.76	44.75	11		12.95
customer	—	155.95	67.4	87.84	—	3.88	7.53			51.5	45.58
Average daily volume:	29.5	1,657.98	730.3	1,146.44	278.63	31.75	238.53	177.69	20	293.6	316.53
own account	29.5	—	35.5	—	278.63	—	224.49	177.69	20		41.11
customer	—	1,657.98	694.8	1,146.44	—	31.75	14.04			293.6	275.42
Average trade size:	1.9	10.63	9.61	13.05	4.28	8.19	3.39	3.97	1.82	5.7	5.41
own account	1.9	—	4.13	—	4.28	—	3.58	3.97	1.82		3.17
customer	—	10.63	10.31	13.05	—	8.19	1.86			5.7	6.04

Table 5
Dual Trader Personal Trading Revenues Per Contract on Their Exclusive Local Days
S&P 500 and Japanese Yen Futures

Revenues per contract (in dollars) are calculated for dual traders' personal trades on their local days for the pre-rule period. Dual-duals are floor traders who dual traded both before and after dual trading restrictions during our sample period. Dual-brokers (dual-locals) are floor traders who dual traded before the restrictions but switched to trading only for their customers' (own) accounts following the restrictions. Dual-quitters are floor traders who dual traded before the restrictions but quit trading in the affected contract month afterwards. The z-statistic tests for differences in median revenues between continuing and the other groups of dual traders. Significant differences in median values are starred. The sample periods are May 1 to June 20, 1987 for the S&P 500 and April 1 to May 19, 1991 for the Japanese Yen.

	Dual-duals	Dual-brokers	Dual-locals	Dual-quitters
		S&P 500		
Mean Profits	0.43	259.5	19.5	158
Standard deviation	486.5	1121.5	477.5	680
Minimum	-3565	-1075	-3240	-2624.5
1st Quartile	-9.5	-217.5	-8.5	-23
Median	17.5	50	17	38
3rd Quartile	50	84.5	42	175
Maximum	3650	3308.5	3442.5	3712.5
Difference in medians		32.5	-0.5	20.50*
Wilcoxon z-statistic (p value)		0.47534 (0.6345)	0.17173 (0.8636)	z=2.68627 (0.0072)
	N=464	N=13	N=834	N=135
		Japanese Yen		
Mean Profits	41.25	275	-0.125	75
Standard deviation	1617.5	318.75	1063.75	458.75
Minimum	-7412.5	50	-5487.5	-475
1st Quartile	-100	50	-137.5	-300
Median	56.25	275	76.25	50
3rd Quartile	193.75	500	226.25	625
Maximum	10500	500	4781.25	708.75
Difference in medians		218.75	20	-6.25
Wilcoxon z-statistic (p value)		0.8798 (0.379)	-0.74814 (0.4544)	z=0 (0.9999)
	N=89	N=2	N=258	N=7

Table 6
Dual Traders' Execution Skills
S&P 500 and Japanese Yen Futures

Trading costs (in dollars) are calculated daily for each trader's customers in the pre-rule period. Dual-duals are floor traders who dual traded both before and after dual trading restrictions during our sample period. Dual-brokers (dual-locals) are floor traders who dual traded before the restrictions but switched to trading only for their customers' (own) accounts following the restrictions. Dual-quitters are floor traders who dual traded before the restrictions but quit trading in the affected contract month afterwards. Wilcoxon Z statistics for differences in median costs are in parentheses. p values are given below. Significant (at the 10% level) z values are starred. The sample periods are May 1 to June 20, 1987 for the S&P 500 and April 1 to May 19, 1991 for the Japanese Yen.

	Dual-duals		Dual-locals		Dual-brokers		Dual-quitters	
	Dual days	Broker days	Dual days	Broker days	Dual days	Broker days	Dual day	Broker days
S&P 500 Index Futures								
Median costs	0	8.00	-11.25	-18.95	32.30	-42.85	-9.55	-6.70
Trader days	366	224	292	25	123	62	88	84
Wilcoxon z-statistic and p value Dual vs Broker days	(0.27) 0.7905		(-0.21) 0.8334		(-1.64) 0.1005		(-0.83) 0.3226	
Wilcoxon z-statistic and p value On Broker Days:								
vs. Dual-Dual	.		(-1.41) 0.1392		(-2.31)* 0.0176		(-0.89) 0.1261	
vs. Dual-Local	.		.		(-1.23)* 0.095		(0.76) 0.4895	
vs. Dual-Broker	.		.		.		(0.18) 0.8367	
Japanese Yen Futures								
Median costs	18.75	31.25	59.375	9.375	21.875	3.125	37.5	139.06
Trader days	473	326	13	3	8	40	11	7
Wilcoxon z-statistic and p value Dual vs Broker days	(1.57) 0.1162		(-1.08) 0.2818		(-0.73) 0.4635		(1.09) 0.2771	
Wilcoxon z-statistic and p value On Broker Days:								
vs. Dual-Dual	.		(-0.58) 0.3904		(-0.42) 0.5536		(1.27) 0.1369	
vs. Dual-Local	.		.		(-0.34) 0.6367		(2.33)* 0.0423	
vs. Dual-Broker	.		.		.		(1.75) 0.1294	

Table 7

Customer Trading Costs Before and After Dual Trading Restrictions S&P 500 and Japanese Yen Futures

Changes in customer trading costs due to dual trading restrictions are estimated from the following regression:

$$S_t = a_0 + a_1 V_t + a_2 VOL_t + a_3 M_t + a_4 D_t + e_t$$

where, for day t, S_t is the measure of customer trading costs (average buy price minus average sale price) in dollars, V_t is customer trading volume, VOL_t is the standard deviation of buy prices for customer trades, M_t is the number of floor traders trading for their own account, and D_t = 1 in the pre-rule periods and 0 otherwise. T-statistics are shown in parentheses. N is the number of observations. The sample periods are May 1 to June 20, 1987 for the S&P 500 and April 1 to May 19, 1991, for the Japanese Yen.

S&P 500 Index Futures				
a_0	a_1	a_2	a_3	a_4
20.21 (3.44)	-0.0005 (-2.00)	0.168 (4.13)	-0.03 (-0.81)	4.74 (1.30)
N = 63	F = 11.083	*Prob* > F = 0.001		
Japanese Yen				
-1.62 (1.33)	-0.0001 (0.33)	1129.3 (2.47)	0.04 (1.25)	0.07 (0.079)
N = 63	F = 5.036	*Prob* > F = 0.0015		

Notes

1. The regulations allow affected exchanges to petition for relief based on 1) an acceptable audit trail, or ability to track a floor traders' activities, or 2) a threat to the hedging utility and price discovery function of futures markets, should the practice of dual trading be prohibited. All affected exchanges have petitioned for relief, although the CFTC has yet to act on these petitions.

2. See below for a more detailed review of the theoretical literature.

3. In Fishman and Longstaff (1992), the effect of dual trading on liquidity may or may not be negative. However, Sarkar (1995) shows that, if the assumption of fixed volume in the former paper is relaxed, then dual trading may reduce liquidity. In Roell (1990), market liquidity is lower because of dual trading, although some uninformed traders are better off.

4. We recognize these are idealized types. It is quite possible, for example, that trading skills are necessary to exploit private information. We simply require that the primary source of dual traders' revenues is trading skills in one case, and private information in the other. Our results establish the existence of such types of dual traders.

5. CME's top-step rule (Rule 541) states: *A member, who has executed an S&P 500 futures contract order while on the top step of the S&P 500 futures pit, shall not thereafter on the same day trade S&P 500 futures contracts for his account.*

6. Rule 552 banned dual trading in all "mature liquid " contracts. The main criterion in determining a "mature liquid" contracts was that contracts have "daily average volume of 10,000 contracts or more...over the previous six months" (CME Special Executive Report, May 3, 1991).

7. As of December 1991, five commodities had been affected by Rule 552: Pound Sterling, Swiss Franc, Japanese Yen, Deutsche Mark, and Eurodollars. Our choice of the Yen was determined by the availability of data. However, Chang and Locke's (1996) study of Rule 552 shows that the Yen is representative of the group of affected contracts.

8. Locals are floor traders who trade exclusively for their own accounts.

9. Chakravarty (1994) shows that increased competition may lower the payoff to dual trading. In his model, high volume markets will be more competitive, and less susceptible to dual trading abuses. Chakravarty and Sarkar (1995) argue that the number of brokers in a pit and dual traders' frontrunning profits are negatively correlated. Advances in trading technologies may also make it easier to detect trading abuses.

10. The difference in the size of the pre-rule and post-rule samples arises because the two regulatory events do not fall exactly in the middle of our sample period.

11. The 2% filter is used to allow for the possibility of error trading. As Chang, Locke and Mann (1994) state, "when a broker makes a mistake in executing a customer order, the trade is placed into an error account as a trade for the broker's personal account. The broker may then offset the error with a trade for the error account. A value of 2% for this error trading seems reasonable

from conversations with CFTC and exchange staff."

12. This number may be relatively high because all CME memberships allow for trading in the S&P 500 futures pit.

13. We exclude floor traders who were locals on some days and exclusive brokers on other days. There were 64 such traders in the S&P 500 futures pit and 16 in the Yen pit. This daily switching is not considered dual trading, yet these traders are not necessarily brokers or locals.

14. Following the top-step rule, traders may still be identified as dual traders if they 1) dual trade off the top-step; or 2) are brokers who have a large percentage (more than 2%) of error trades on their own account, making them appear as dual traders.

15. Following rule 552, traders may still be identified as dual traders if they 1) switch from trading as a broker to trading as a local once a day; or 2) are brokers with a large percentage of error trades (more than 2%)) on their own account, making them appear like dual traders.

16. Traders enter and leave futures pits on a regular basis. The normal attrition rate refers to the percentage of existing floor traders who discontinue trading in their home pit in the subsequent month. The total number of traders in the pit need not fall, however, since new traders are entering the pit each month. The 10% number was obtained from informal conversations with CME sources.

17. As suggested above, there are likely to be some exchange members who wander into these pits infrequently, in addition to the regular, active floor traders semi-permanently stationed in the pit. However, Kuserk and Locke (1992) present evidence of the lack of migration of traders across various commodities within a day. Chang, Locke and Mann (1994) examine the exchange-wide trading of traders in the currency and Eurodollar markets affected by Rule 552.

18. For the Yen, the two sample median test (with normal approximation) does show that dual traders who became locals after dual trading restrictions had higher per contract revenues compared to continuing dual traders. This result is significant at an 11% level.

19. However, our data does not allow us to identify the end-users of the futures contract. In other words, we know when a floor trader is executing an order for a customer, but we have no information on the identity of that customer. Thus, floor trader-customer linkages, which are likely important, are obscured.

20. Note that, since these are customer costs of trading, the expectation is that the numbers will be positive for the typical broker. A negative number implies that customers are buying on average at a lower price than they are selling, which is not consistent with the notion that customers are demanding liquidity. However, the median customer costs are of both signs across the groups and commodities.