Scalper Behavior in Futures Markets: An Empirical Examination

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INTRODUCTION

This article offers an empirical view of scalper behavior. It extends the research begun by Working (1967, 1977) and Silber (1984) by using a more extensive data set to examine scalping in 12 different commodities. Trading strategies employed by scalpers, including brokering and trading in multiple commodities, are examined. Revenue opportunities available to scalpers across markets and through the brokering process are considered also.

The article develops a methodology to identify scalpers by using an historical account of their trading activity. To date there is no formal procedure for identifying scalpers at futures exchanges. The exchanges do not designate a special class of traders as scalpers.

The earliest study of scalping behavior is provided by Working who finds that traders who identify themselves as scalpers act "as if" they are marketmakers. Their income is derived from the frequent buys (sales) at the bid (ask) followed by an expected favorable price movement so that they may then sell (buy) at the ask (bid). He also finds that on a larger scale there exists a group of floor traders who on any particular day trade large numbers of contracts and hold either a zero position, a small overnight net position, or an even position (long positions in one expiration are balanced with short positions in another expiration).

Silber provides details of trading activity for a single scalper on the floor of the New York Futures Exchange. Like Working, he finds that a successful scalping strategy involves frequent trading, in small quantities and with little inventory accumulation. Smidt (1985) summarizes these intuitions while adding some personal observations about trading floor "ecology" in the futures pit. Brorsen (1989) focuses on measuring liquidity

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costs by examining scalping returns, the primary component of liquidity cost. Using time and sales records, Brorsen measures the possible returns to scalping assuming that a scalper follows either of two naive filter rules. Applying these rules to the Chicago Board of Trade corn futures contract he finds that a scalper can earn returns of about 0.06 to 0.08% of contract value.[1] This is approximately 2 to 3 times the rates found by Working and Silber. This study finds significantly smaller returns for financial futures and comparable returns for agricultural futures.

Brorsen also analyzes asset price bid–ask spreads. Stoll (1989) points out that bid–ask spread models generally incorporate order processing costs, inventory costs and adverse information costs, to varying degrees.[2] Empirical studies of the determinants of bid–ask spreads in the stock market demonstrate that each of these components plays a role in the determination of the equilibrium spread. There are, however, few empirical studies documenting the mechanics used by futures scalpers to generate income from quoting and adjusting a bid–ask spread.

This article considers the diversity and consequences of scalping on the floor of the Chicago Mercantile Exchange (CME). Following Working and Silber, a liberal empirical definition of scalping is used to select a representative sample of scalpers from the group of all floor traders trading for their own account. Day traders and other longer term speculators are eliminated from the analysis. The data consists of the futures transactions recorded in the Computerized Trade Reconstruction (CTR) records from the CME for July through September, 1990.[3] These records, also transmitted to the Commodity Futures Trading Commission, are a transactions account of activity on the floor of the CME. The records are compiled at the end of a trading day from paper records for trade clearing and surveillance purposes. The following relevant information is gathered from each record:

1. An indication of floor traders on both sides of a transaction.
2. The price and number of contracts traded and which contract and expiration month are being traded.
3. Whether the transaction is for:
   a. The floor trader's own account (*Own Account*).[4]
   b. The floor trader's clearing firm's account (*House*).

[1]The term "contract value" as used by Brorsen and others, refers to the number of units of a commodity in the contract times the futures price. This is not the actual value of the futures contract. A futures contract has zero value initially since it is merely a commitment to deliver a commodity at the present futures price at a stipulated future date. As the futures price changes, a contract acquires a positive or negative value because a new contract could be entered into at a greater or lesser price than previously. However, in the process of marking a contract to market, usually at the end of the trading day, the value of the contract is once again set to zero.

[2]Demsetz (1968) and Tinic (1972) emphasize order processing costs as an important component of the bid–ask spread. Stoll (1978a, 1978b), Ho and Stoll (1981), and Amihud and Mendelson (1980) consider the role of inventory holding costs due to the risk assumed by dealers in setting a spread. Bagehot (1971), Copeland and Galai (1983), Glosten and Milgrom (1985), and O'Hara and Oldfield (1986) focus on the role of adverse information costs on the spread.

[3]Futures options trading is eliminated from the analysis and left for further research. The omission of options trading may effect results to a minor extent, especially in the less liquid contracts. If in the less liquid contracts floor traders who make markets also trade that commodity's options, and these are relatively active, then the income and activity variables for these floor traders will be understated here.

[4]While the floor traders principal trading is followed, any trading for his own account which the floor trader executes via another floor trader is not tracked. Thus, the data do not reveal a complete record of a floor trader's own account.

c. Another floor trader (*Other Floor*).
d. A non-member customer (*Customer*).
4. Time indicators.[5]

Data is collected on all active futures on the CME, with all trading expirations incorporated into the analysis.[6] Representative scalpers for each of 12 commodities are selected using criteria suggested by Working (1967) and Silber (1984).

The degree to which scalper incomes vary across commodities is examined as well as the relationship between incomes and income volatilities. If scalpers are risk averse, then scalper incomes in particular commodities should be positively related to income volatilities in those commodities. In addition, per contract returns to scalping across commodities are examined. This is what Stoll (1989) refers to as the realized bid–ask spread.

Floor traders may trade both for their own account and for customers. Floor trader income comes from two potential sources: speculative income (including scalping), and floor brokerage. This study hypothesizes that the most active (in terms of volume) scalpers tend to avoid brokering, since expected scalper income will exceed potential brokering revenue over any time interval. In addition, these active scalpers focus on a particular commodity. The degree to which representative scalpers broker within the market and across commodities is investigated also.

OVERVIEW OF THE MARKETS

The various commodity contracts on the CME may be characterized by the overall level of trading activity, open interest, the number of participating traders, and activity by type of customer (i.e., *Own Account, House, Other Floor or Customer Account*). Tables I and II present general statistics on trading activity and open interest on the 12 commodities over the sample period. Commodities of similar type, i.e. currencies, agricultural commodities, equities, or interest rates, are similar in terms of activity but are distinct from other groups of commodities.

Table I compares the commodities by size. The most active markets, as measured by the number of trades and volume, are the financial instrument contracts. The S&P 500 (S&P) leads all CME futures in terms of number of trades with an average of 14,352 trades per day (all expirations) over the sample period. Volume of contracts traded, however, is dominated by the 90-day Eurodollar (EURO$) contract, with an average of 152,634 contracts traded per day. This difference is related to the relatively large average EURO$ trade size of 20.39 contracts (the modal transaction size is 20 contracts, compared to 1 for S&P). Four other financial contracts, the Deutsche Mark (DMARK), Swiss Franc (SFRANC), Japenese Yen (YEN) and British Pound (POUND), are also relatively active markets. 90-day T-Bills (TBILL) and Canadian Dollars (CAN$) are the least actively traded financial contracts.

Contracts on three of the agricultural commodities generally hold the middle ground in terms of trading activity during the sample period. The Live Cattle (LCAT) contract is the

[5]Each trade has associated with it a time stamp for the 15-minute bracket during which it is executed. In addition, there is a computer generated minute time stamp. The default minute for locating a trade record within the 15-minute bracket is the first minute of that bracket. In other words, if a trade cannot be located accurately within the bracket, it is given the time stamp of the first minute of the bracket. The time between trades is important, but the distribution of this variable has problems due to the data set.

[6]Trading in other futures is included in some calculations. LIBOR, Australian Dollars, and Random Length Lumber trading is included in exchange-wide income and volume measurement. NIKKEI and interest rate differential contracts are used only for exchange-wide volume. No option trading is considered.

Table I
SUMMARY STATISTICS FOR CME FUTURES MARKETS
JULY–SEPTEMBER 1990

Commodity	Normal Trading Hours (Central Time)	Total Number of Trades	Average Trades per Day	Total Volume	Average Daily Volume	Open Interest, August 17	Nearby Price, August 17	Average Trade Size
POUND	7:20 AM to 2:00 PM	168,074	2668	992,929	15,761	42,992	119,625	5.91
CAN$	7:20 AM to 2:00 PM	62,879	998	353,871	5617	42,683	87,050	5.63
DMARK	7:20 AM to 2:00 PM	332,858	5283	2,191,806	34,791	72,241	80,800	6.58
SFRANC	7:20 AM to 2:00 PM	326,773	5187	1,782,540	28,294	52,988	97,525	5.45
YEN	7:20 AM to 2:00 PM	268,909	4268	1,884,021	29,905	62,026	84,813	7.01
EURO$	7:20 AM to 2:00 PM	471,575	7485	9,615,916	152,634	732,581	979,850	20.39
TBILL	7:20 AM to 2:00 PM	53,799	854	522,377	8292	39,382	981,700	9.71
S&P	8:30 AM to 3:15 PM	904,148	14,352	2,997,760	47,583	133,696	164,325	3.32
LCAT	9:05 AM to 1:00 PM	220,602	3502	918,565	14,580	68,417	36,160	4.16
HOGS	9:10 AM to 1:00 PM	163,863	2601	540,701	8583	30,045	23,010	3.30
BELLIES	9:10 AM to 1:00 PM	115,924	1839	251,894	3997	5804	19,250	2.17
FCAT	9:05 AM to 1:00 PM	43,886	697	105,774	1679	11,515	39,446	2.41

The number of trades measures the number of agreements between floor traders. The price is the settlement price times the number of units in the contract. This number is the average number of contracts in an agreement between floor traders.

Table II
CME FUTURES MARKET FLOOR TRADER CHARACTERISTICS
JULY–SEPTEMBER 1990

Commodity	Trades (Average Daily Buys by Trade Type)				Volume (Average Daily Buys by Trade Type)				Average Daily Traders (by Trade Type)			
	Own Acct.	House Acct.	Other Floor	Cust.	Own Acct.	House Acct.	Other Floor	Cust.	Own Acct.	House Acct.	Other Floor	Cust.
POUND	1117	362	101	1088	4686	3495	511	7069	41	28	16	40
CAN$	364	94	62	478	1573	972	358	2713	21	11	8	16
DMARK	2523	569	386	1806	12,048	6555	2094	14,092	99	40	28	61
SFRANC	2173	621	256	2137	9628	5787	1040	11,838	84	43	30	61
YEN	1921	488	303	1556	10,020	6918	1527	11,440	78	38	26	58
EURO$	3618	937	562	2368	66,726	26,628	8946	50,311	233	71	69	100
TBILL	354	80	34	386	2997	1389	324	3580	29	11	7	22
S&P	7168	770	1003	5411	18,275	4231	3294	21,782	270	61	68	84
LCAT	1472	81	224	1724	6417	375	1070	6714	73	19	28	55
HOGS	1000	50	160	1365	3700	208	743	3857	54	12	18	35
BELLIES	851	34	80	875	1855	77	250	1814	49	10	14	27
FCAT	285	7	40	365	686	22	95	875	14	3	6	12

Trades are the number of agreements between floor trades. Buys were used without loss of generality. The percentages were nearly identical for sells. The percentages of sell volume by trade type is nearly identical to buys.

most active of these contracts with an average of 14,580 contracts traded on 3502 trades per day. This is roughly half the SFRANC or YEN volume. Activity in the Live Hogs (HOGS) contract is second to LCAT followed by trading in Pork Bellies (BELLIES). Feeder Cattle (FCAT) is at the bottom in terms of contracts traded.

As measured by average trade size (Table I, column 8) the markets are clearly grouped by the nature of the underlying commodity or instrument, regardless of activity in the contract. EURO$ and TBILL have the highest average number of contracts traded per trade. As a group, the currency contracts form the middle group, with average trade size extending from a low of 5.45 average contracts per trade for SFRANC to a high of 7.01 average contracts per trade for YEN. The agricultural contracts have the smallest average trade size, ranging from an average of 2.17 BELLIES contracts per trade to 4.16 LCAT contracts per trade. S&P trades also tend to be small, with an average of 3.32 contracts per trade.

The sixth column of Table I presents the open interest (all expirations) on August 17, 1990, approximately the midpoint of the sample period. Average daily volume as a fraction of open interest varies from market to market. For CAN$ it is relatively low, around one contract traded a day per eight contracts of open interest. For BELLIES, daily volume is more than half of the open interest. A high ratio of volume to open interest may indicate a large degree of intraday speculative activity in the contract. However, a high ratio might be caused from open interest that is composed of spread positions.

Table II presents a breakdown of the volume in individual commodities by trade type. This table reveals a preponderance of *Own Account* and *Customer* trading, with much less trading for *House* or *Other Floor*. The proportion of *House* trading varies from commodity to commodity. For example, there is very little *House* trading in the agricultural markets. Currencies and interest rate futures have the highest level of *House* trading. Clearing members (whose account activity is indicated by the *House* designation) appear to trade mostly in financial futures.

"Number of traders" per day measures the number of floor traders trading particular customer types on a day. Individual floor traders may trade for more than one customer type in a day. *Own Account and Customer* have the largest mean populations per day. In relatively active EURO$ and S&P the ratio of the number of traders trading for their own account to traders acting as a broker is over two. In the less active contracts this ratio falls to a little over one. This partial analysis suggests that the relative number of scalpers may rise as volume increases across contracts.

SCALPER SELECTION

The universe of floor traders trading for their own account is subset to include only those traders who trade in a manner consistent with scalper behavior described by Working. He states that "scalpers who devote their attention primarily to the smallest dips and bulges make a great number of purchases and sales each day, tend to hold the resulting speculative positions for only brief intervals of time, and almost invariably end the day with zero speculative position." This description is supported by Working and Silber's case studies. Working found that a typical scalper holds positions open from 1 to 9 minutes and trades only 1 to 4 contracts at a time. Silber found the average scalper holds positions open for approximately 2 minutes and trades an average of 2.9 contracts per trade. Working also found that a large group of floor traders hold either zero, even (offsetting positions in different contract months) or small net overnight positions.

Working and Silber selected scalpers and then analyzed their trading behavior. This study analyzes trading behavior and then attempts to identify scalpers. There is no

general set of parameters which can be used to define all scalpers. It is expected that the parameters which define a scalper vary across commodities. An indication of these differences is apparent in the summary statistics of Tables I and II. For instance, the average number of trades per day, whether by all participants in a market, as shown in Table I, or by different trade types, as given in Table II, varies widely among commodities. Thus, scalper selection criteria which consider the number of trades or time between trades will be affected by this phenomenon. This necessitates a methodology which is flexible to accommodate market idiosyncracies.

The scalper selection methodology used here relies on setting parameters, or cut-off points, for four measures that summarize trader behavior. The measures are average daily closing position, average daily number of trades, average daily median elapsed time between trades, and average trade size. Four measures are utilized since any one measure may not be sufficient to segregate scalpers from other types of traders. For instance, while scalpers have a tendency to end the day with a zero speculative exposure, position traders may exhibit this behavior also. However, in contrast to scalpers, position traders tend to trade less frequently and in bigger lot sizes. The use of four criteria allows greater flexibility in the setting of individual parameters. Note that the purpose is not to determine the set of *all* scalpers in a commodity, but rather a group most likely composed of scalpers.

To allow for daily variations in a scalper's trading behavior, monthly averages of the daily measures are calculated. The average daily net closing position is the difference between what a floor trader purchases and sells on a particular day for his own account in the most active trading month for a commodity.[7] This characteristic addresses the observation that scalpers end the day with a zero speculative position. The use of average daily number of trades follows from the observation that scalpers are the most active traders in a market. Floor traders who pursue speculative and position trading strategies are assumed to trade less often than scalpers. Therefore, if scalpers trade more frequently, they will be characterized by a shorter elapsed time between trades. For this characteristic, the daily median time between trades is calculated and then averaged over the month. Finally, the average trade size is established to address the observation that scalpers trade small positions.

Monthly averages of the four measures are then grouped and used to construct a histogram for each commodity. These are presented in aggregate form in Figures 1 through 4. Parameters, or cut-off points, are determined for each of the four measures by examining the trading activity of all traders and then identifying a point where a significant number of traders switch from what is considered to be scalper behavior to some other sort of trading behavior. A summary of the parameter selections is presented in Table III.

Figure 1 contains the distribution for average daily ending inventory. As indicated by the well-defined peak at zero, between approximately 20 and 65% of floor traders end the day with a very small inventory—i.e., between −0.5 and 0.5 contracts—depending on the particular commodity. An average absolute value of one or two contracts is sufficient

[7]The most active trading month is used for all commodities except the Eurodollar contract. Trading for all Eurodollar contract months is considered. An initial examination of the distribution of traders for average daily closing position of the most active contract revealed that few traders hold zero or small overnight positions. This ordinarily would be taken as an indication that few scalpers exist in this market. Combining the trading for all markets and netting, however, revealed that a substantial number of traders hold neutral overnight positions. This indicates that traders hold long positions in one expiration against short positions in another expiration, suggesting that traders in this market have a tendency to trade more spread positions than in other markets.

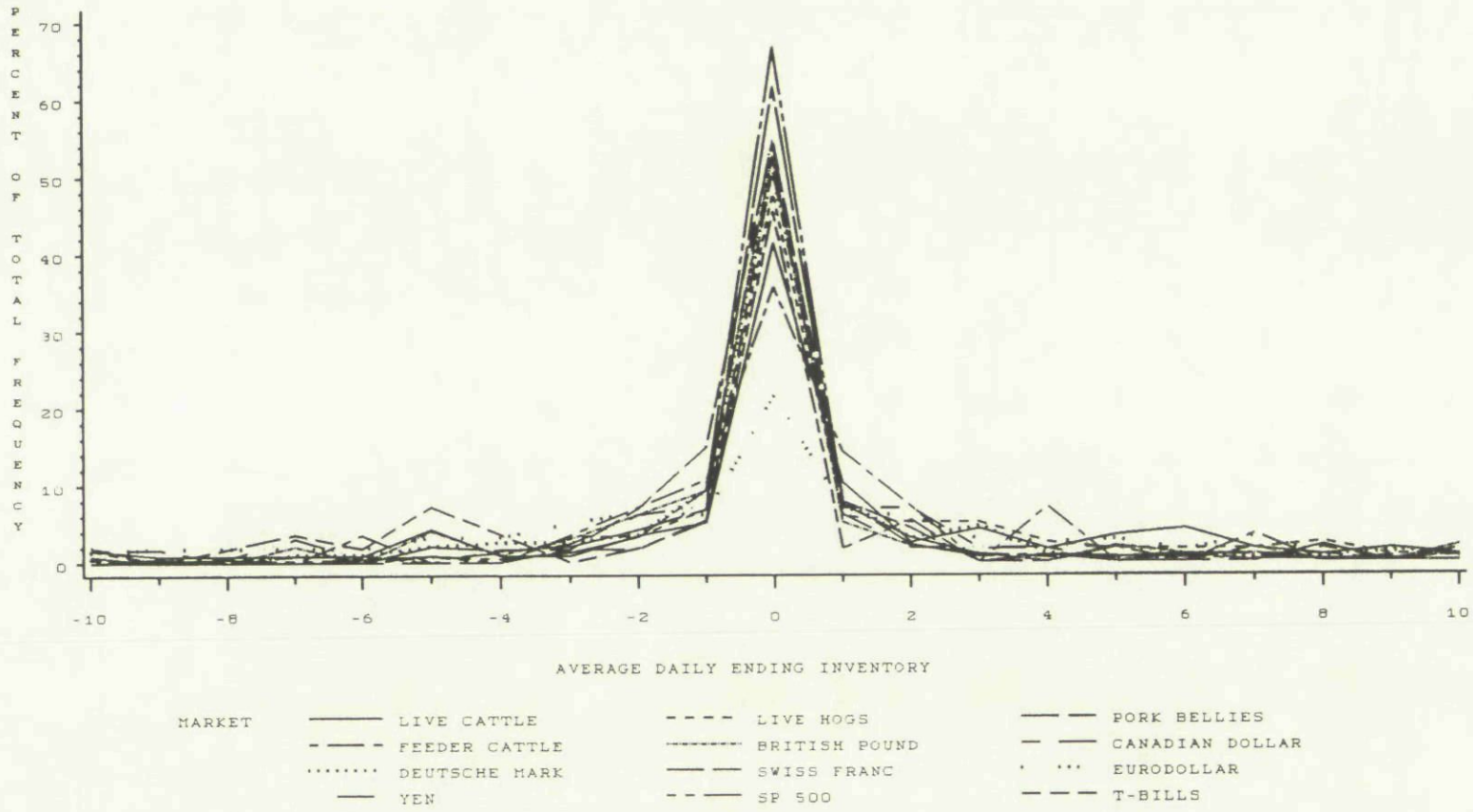

Figure 1

Percentage frequency of floor traders by average daily ending inventory for the month of July 1990. Average daily inventories greater than 10.5 and less than −10.5 have been deleted from the graph. Each observation represents the percentage of total traders with an average daily ending inventory plus or minus 0.5 contracts of the indicated tick point.

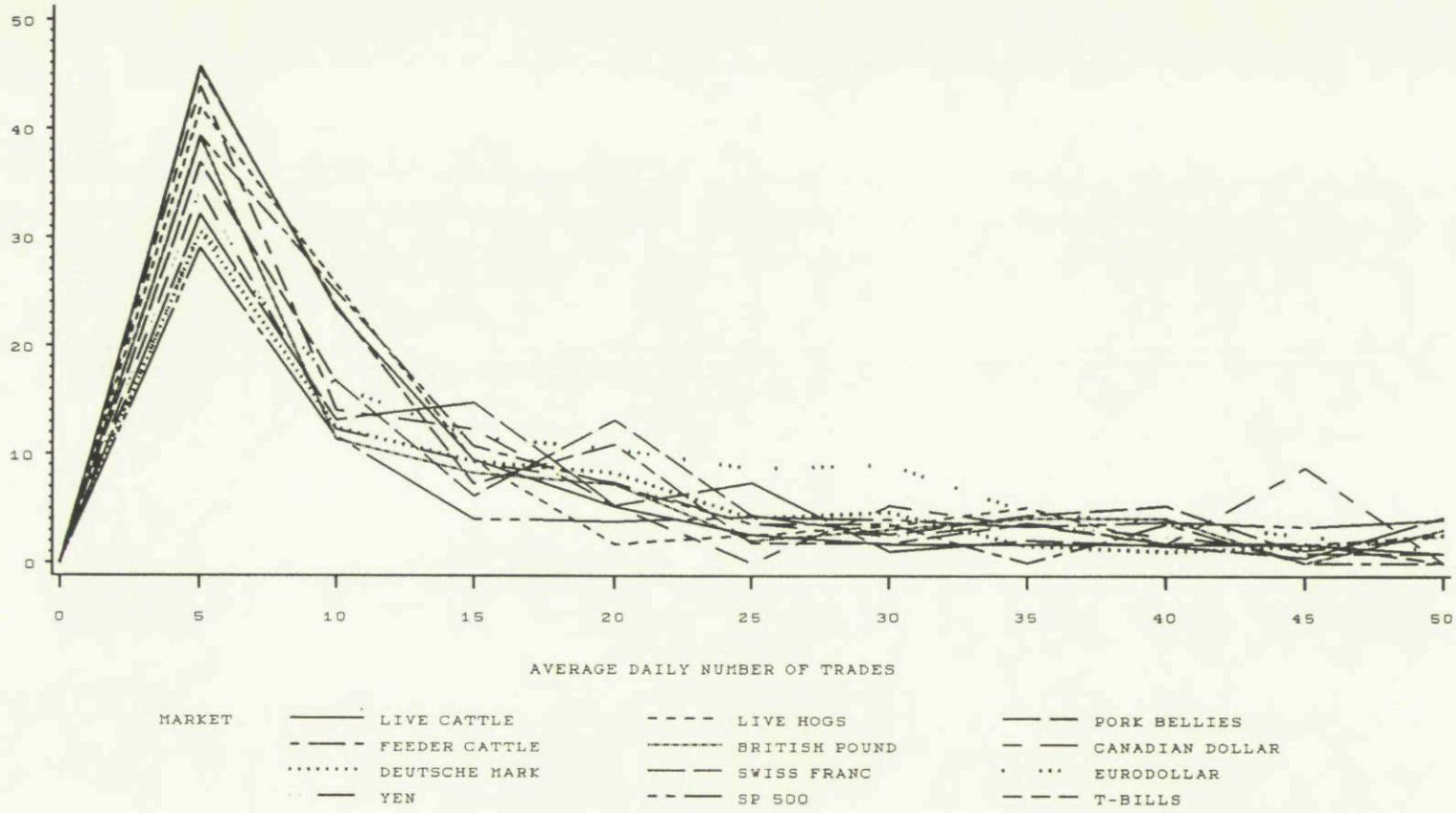

Figure 2

Percentage frequency of floor traders by average daily number of trades for the month of July 1990. Average daily number of trades greater than 50 have been deleted from the graph. Each observation represents the percentage of total traders with an average number of trades less than the indicated tick point and greater than the preceding tick point.

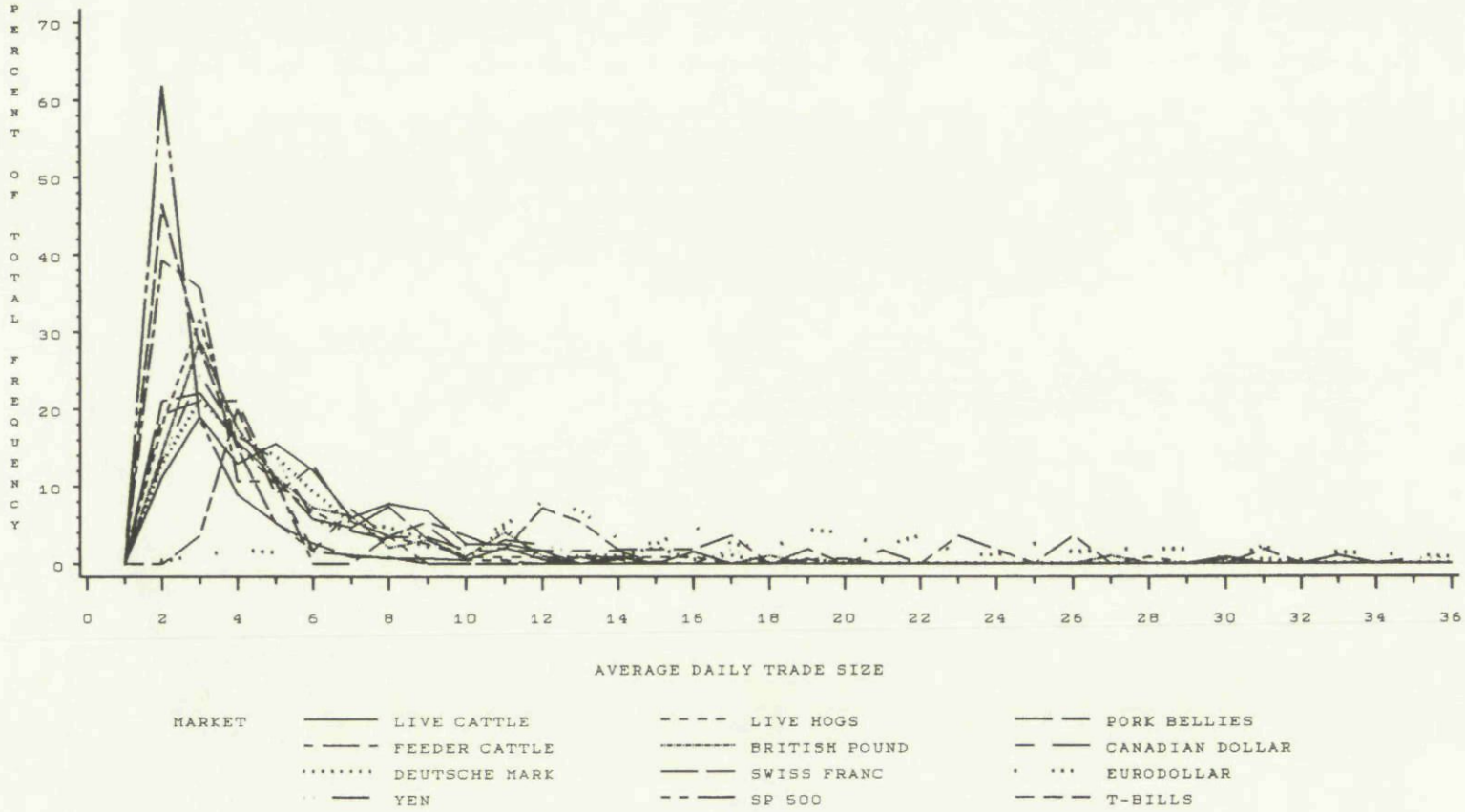

Figure 3

Percentage frequency of floor traders by average daily trade size for the month of July 1990. Average daily trade sizes greater than 36 have been deleted from the graph. Each observation represents the percentage of total traders with an average daily trade size less than the indicated tick point and greater than the preceding tick point.

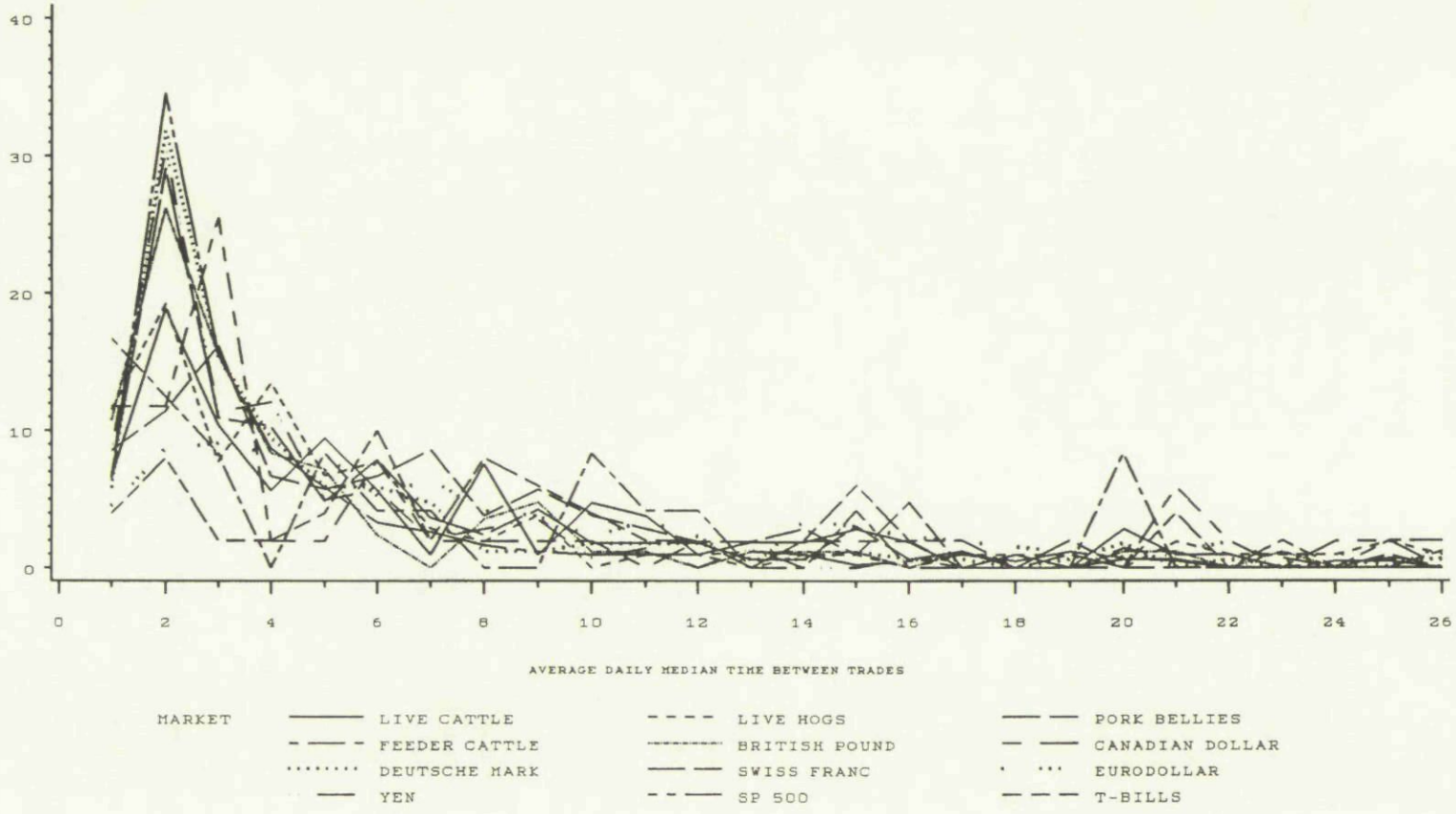

Figure 4

Percentage frequency of floor traders by average daily median time between trades for the month of July 1990. Average daily median time between trades greater than 26 have been deleted from the graph. Each observation represents the percentage of total traders with an average daily median time between trades less than the indicated tick point and greater than the tick point.

Table III
SELECTION PARAMETERS FOR SCALPERS

	Daily Floor Trading Characteristics			
Commodity	Minimum Average Activity (X) (Daily Trades)	Maximum Average Trading Time (T) (Minutes)	Maximum Average Daily Position (I) (Absolute Change)	Maximum Average Trade Size (Q) (Contracts)
POUND	$X > 25$	$T < 5$	$I < 2$	$Q < 5$
CAN$	$X > 10$	$T < 6$	$I < 2$	$Q < 5$
DMARK	$X > 25$	$T < 7$	$I < 2$	$Q < 5$
SFRANC	$X > 15$	$T < 6$	$I < 2$	$Q < 6$
YEN	$X > 15$	$T < 9$	$I < 2$	$Q < 5$
EURO$	$X > 25$	$T < 10$	$I < 3$	$Q < 30$
TBILL	$X > 10$	$T < 11$	$I < 2$	$Q < 10$
S&P	$X > 25$	$T < 7$	$I < 2$	$Q < 5$
LCAT	$X > 10$	$T < 16$	$I < 2$	$Q < 6$
HOGS	$X > 10$	$T < 9$	$I < 2$	$Q < 8$
BELLIES	$X > 10$	$T < 16$	$I < 2$	$Q < 6$
FCAT	$X > 10$	$T < 15$	$I < 2$	$Q < 6$

Daily trades are the number of transactions, not the number of contracts traded. The time between trades is measured on a minute-by-minute basis, although this requires some discussion. The CTR algorithm is biased towards placing transactions at the beginning of a 15-minute interval, but the sequence of floor trader *Own Account* trades should be preserved. These average times should be viewed as particular to the CTR and are not necessarily representative of actual trade times. The hope is that there is a correspondence between the two times. The daily position is the net contracts bought or sold over a day. Trade size is the average contracts traded per transaction.

to distinguish scalpers from other types of traders. Thus, for the ending inventory criterion, scalpers are identified as having an average daily absolute ending inventory of less than two contracts. The exception to this is EURO$ where the cut-off is extended to three contracts. As shown in Figure 1, EURO$ has the lowest percentage of traders at the zero ending inventory level along with thicker tails.

Figure 2 shows the distributions associated with the average time between trades for floor traders. Time between trades may be related to other factors such as the volume of trading, the tendency for brokers to break up large trades, and the number of active scalpers in a pit which in turn is a function of the profitability of scalping in that pit. As a result, the parameters selected to separate scalpers from other floor traders with respect to the elapsed time between trades, differ more so than for the daily ending inventory parameters. The parameters for this criterion are set at the point where the distribution smooths out at an arbitrarily low level. For the currency contracts, traders who trade more often than between every 5 and 9 minutes are selected. The distributions for S&P and HOGS also smooth out around the 7- and 9-minute levels, respectively. The remaining agricultural contracts tend to have flatter distributions indicating a longer elapsed time between trades. For these contracts the cut-off parameters are in the 15-minute range. Finally, the TBILL and EURO$ distributions settle down near the 10-minute point.

The distributions of traders by average daily number of trades are presented in Figure 3. This criterion is designed to limit the scalper data set to those individuals who trade often. Thus, parameter levels are selected by noting where the distribution falls sharply after

peaking. Three parameter levels are identified using this procedure. For the agricultural commodities, CAN$ and TBILL traders trading on average more than 10 times a day are selected. A level of more than 15 trades per day is used for SFRANC and YEN. And for EURO$ and S&P, traders who on average trade more than 25 times a day are selected.

The distributions for the final criterion, average trade size, are depicted in Figure 4. Working and Silber indicate that scalpers trade a small number of contracts at a time. Such actions allow them to minimize inventory risk should prices move before a position can be offset. Accordingly, parameters for average trade size are chosen as the point to the right-hand side of the distribution where the distribution levels off. For the majority of commodities this occurs in the 5 to 8 contract range. TBILLS have a slightly higher cutoff level of 10. A clear difference in this criterion, however, is observed with respect to EURO$. The distribution of traders with respect to average trade size is notably flat in comparison to the distributions of other commodities. Also, as noted in Table II, the average size of a trade in this market is 20.39 compared to average sizes of less than 10 for other commodities. The cut-off parameter for EURO$, is 30 contracts.

From the sample of 1961 floor traders who traded during the sample period, 487 are identified as scalpers. Twenty-four of these scalpers are identified in multiple commodities. These are excluded from further analysis to keep commodity analyses independent. For the other 463 scalpers, *home market* is defined as the commodity market where they were identified.

Table IV gives an indication of the proportion of *Own Account* trading in the *home market* by a representative scalper sample. While all scalpers are not included in the subsample, the sample is nevertheless large relative to the respective markets. Further, the sample includes, for most commodities, a majority of the trades for *Own Account.* Exceptions to this are in EURO$, TBILL, LCAT, HOGS, and FCAT. Much of the volume of trading identified as *Own Account* is classified as scalping.

Overall, most floor traders who traded for their own account during the sample period are not identified as scalpers here. Some of these traders are day traders, some are brokers who infrequently trade for their own account, and some are scalpers who have strategies which differ from the selection criteria. This suggests that there is a substantial degree of heterogeneity in floor trader behavior. Only in S&P and BELLIES are a majority of the traders who traded for their own account designated as scalpers.

SCALPING BEHAVIOR BY COMMODITY

Floor traders may earn speculative income in their home market or in other markets in which they are allowed to trade. The daily accrued trading profits for each floor trader's *Own Account* trading serves as a measure of speculative income. The *Own Account* inventory change for each trader is noted. Daily settlement prices are used to place a value on that change. The daily speculative income for each trader in the scalper sample is calculated for days when they trade for *Own Account.* This information is used in calculating the distribution of daily income for scalpers from a *home market* over the sample period. Two sources of speculative income are considered for each scalper, income from trades in their *home market,* and speculative income from trading other commodities. For all scalpers in a particular *home market,* all trades by that trader identified as *Own Account* in that *home market* are considered scalping trades.

The distribution of scalping incomes by *home market* is presented in the left panel of Table V. These incomes are a gross measure and do not take into account fees, commissions or other costs of scalping. The distributions are generally skewed. Median daily scalping incomes range from $240 in LCAT to $1025 in EURO$. The average

Table IV
CME FLOOR TRADER *OWN ACCOUNT* TRADING
JULY–SEPTEMBER 1990

	Scalper's *Own Account* Daily Average			Other *Own Account* Daily Average		
Commodity	**Trades**	**Volume**	**Traders**	**Trades**	**Volume**	**Traders**
POUND	561	1851	13	481	2579	23
CAN$	203	685	8	85	381	8
DMARK	1294	4451	32	990	6200	51
SFRANC	1045	3214	29	922	5496	44
YEN	963	3041	30	869	6618	40
EURO$	1208	17,144	48	2325	47,800	179
TBILL	106	466	6	179	1693	19
S&P	5236	10,925	150	1839	7185	114
LCAT	352	1281	14	925	4385	48
HOGS	353	1244	11	442	566	33
BELLIES	687	1456	29	118	161	16
FCAT	118	288	5	152	128	8

Within each commodity we only use *Own Account* trading by marketmakers identified for that market. "Other" *Own Account* trading in that commodity is by the compliment of the selected marketmakers, where "marketmakers" includes those few identified in more than one market.

median income among the four agricultural commodities is $431. The average median income for financials and currencies is $683. The interquartile range is used as a measure of dispersion. This measure varies from $938 for TBILL to $2600 for EURO$. The first quartile is negative for four commodities.

If a scalper trades for *Own Account* outside his *home market,* the income generated from this activity is included with that from *home market* trading in the calculation of accrued Daily Income: All Commodities. Speculative income derived from these non-*home market* trades is calculated in the same manner as scalping income in the *home market.*

The right panel of Table V presents the distribution of Daily Income: All Commodities. These figures, compared with the income from scalping income alone, show that scalpers on average derive little revenue from speculating in commodities outside their *home market.* This supports the claim from Silber and Working that scalpers tend to specialize in scalping particular commodities, rather than scalping a portfolio of commodities.[8]

The analysis of scalper incomes suggests that scalpers are faced with potentially different income distributions when choosing which commodity to trade. To some extent, the threat of pit migration places a constraint on the income distribution within a particular commodity. To investigate the risk–return relationship across commodities, median trader-day income is graphed against the respective interquartile range by *home market.* Figure 5 reveals a strong positive relationship between median incomes and

[8]While these findings show that the largest scalpers tend to specialize, this is not to say that individual scalping portfolios of commodities do not exist. Recall that 24 traders were identified as scalpers in multiple markets. In addition, the methodology for selecting scalpers is biased against finding scalpers in multiple markets since these individuals would presumably have difficulty passing the high trade volume criterion when evaluated on a single market.

Table V
SCALPER INCOME
DAILY INCOME DISTRIBUTION

	Daily Income: Home Market					Daily Income: All Commodities				
Home Market	Mean	*Q*1	Median	*Q*3	*Q*3–*Q*1	Mean	*Q*1	Median	*Q*3	*Q*3–*Q*1
POUND	1231	−25	969	2325	2350	1298	−50	1038	2538	2588
CAN$	617	−160	510	1310	1470	611	−170	500	1310	1480
DMARK	702	163	588	1238	1075	696	138	575	1200	1062
SFRANC	884	0	700	1938	1938	888	−12	725	1938	1950
YEN	640	88	500	1059	971	607	63	475	1063	1000
EURO$	2148	175	1025	2775	2600	2136	175	1025	2794	2619
TBILL	758	75	450	1013	938	767	75	450	1000	925
S&P	1256	50	725	2150	2100	1279	50	725	2150	2100
LCAT	388	−235	240	1020	1255	401	−240	270	1070	1310
HOGS	1053	−83	390	1625	1708	1109	−118	410	1775	1893
BELLIES	618	140	390	1490	1350	623	−218	380	1535	1753
FCAT	1280	106	702	1732	1626	947	0	682	1795	1795

Income is measured by subtracting the value of buys from the value of sales. If there is an inventory imbalance at the end of the day, this is offset at the settlement price. For either home market or all commodities, all expirations are totalled each day. *Q*1 is the first quartile, *Q*3 is the third quartile, and *Q*3–*Q*1 is the interquartile range.

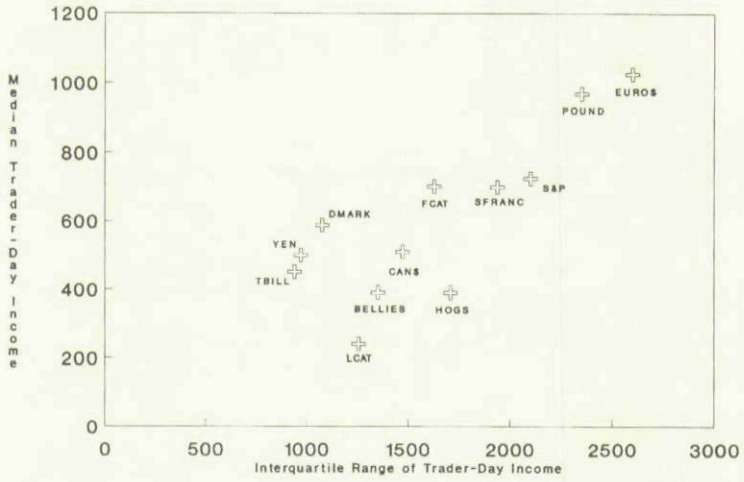

Figure 5
Risk–return analysis of CME marketmaker income
median trader-day incomes and the interquartile range.

income volatility. The hypothesis of a risk–return relationship on the exchange floor is supported. TBILL anchors the low mean–low volatility range, and EURO$ holds the prominent high income–high volatility commodity position. While some distributions appear to be dominated by others, the differences could be due to the short time frame of the data. A model of pit migration, or inter-pit equilibrium, could depend on longer run income distributions, and relatively high pit-specific human capital. Such a model would be consistent with these seemingly "dominated" short-run income distributions.

To compare the effects of scalping across commodities, the daily realized bid–ask spread is examined. [See Stoll (1989) for a comparison of quoted and realized bid–ask spreads.] The measure of the realized bid–ask spread is the volume-weighted scalper sell price minus the volume-weighted scalper buy price. The representative scalper sample is used. The realized spread can be construed as the expected scalper revenue from a round-trip (one buy and one sell) in the interval. Similarly, this measure is a proxy for the average round trip cost for a non-member futures customer trading against scalpers. For each commodity, the daily realized spread is the volume-weighted average of expiration-specific realized spreads.

Some differences are expected in the realized spreads across commodities. Differences could be related to price risk, as in Stoll (1989), or asymmetric information, as in Copeland and Galai (1983). Scalpers in financial futures compared to those in agricultural markets have quicker and easier access to a richer information set of cash market prices and activity. Agricultural futures scalpers may face more risk due to asymmetric information. This could lead to lower liquidity costs on financials. Bagehot (1972) argued that marketmakers must earn more from liquidity-motivated transactors to compensate for losses to informed transactors.

Table VI presents statistics on daily realized spreads across commodities. There are 63 daily observations for each commodity. The first column gives the mean daily realized spread for each commodity. The second column gives the mean spread as a percentage of the mid-period underlying commodity value. Support is found for the information asymmetry argument, since currency and interest rate products appear to have the lowest return per round trip, while agricultural futures have relatively high returns.

Table VI
SCALPER'S REALIZED BID–ASK SPREADS DAILY CALCULATIONS, JULY–SEPTEMBER 1990, ALL EXPIRATIONS COMBINED

Home Market	Mean Spread	Percent Spread	Median Spread	Standard Deviation
POUND	6.16	0.0051	6.27	10.23
CAN$	7.34	0.0084	8.56	12.74
DMARK	5.62	0.0070	5.46	7.78
SFRANC	7.66	0.0079	8.48	11.74
YEN	7.53	0.0089	7.23	8.75
EURO$	8.14	0.0035	7.69	3.02
TBILL	14.37	0.0062	11.83	14.71
S&P	19.03	0.0116	14.55	23.24
LCAT	4.44	0.0123	4.59	9.52
HOGS	12.44	0.0541	11.91	14.78
BELLIES	11.89	0.0618	14.21	25.97
FCAT	21.24	0.0538	21.82	13.34

The mean, median, and standard deviations are for daily volume weighted realized bid–ask spreads for each commodity across expirations. Realized spreads are first calculated for each expiration, and then a weighted sum is formed across expirations within each commodity. The percent spread is the mean spread from column 1 divided by the nearby value on August 17, 1990, which may be found in column 7 of Table II.

This analysis of scalper daily income and realized spreads reveals significant heterogeneity of scalper revenue functions across commodities. The comparison of median incomes and volatilities shows that at least some of the heterogeneity of incomes could be explained by relative levels of commodity specific risk. The distribution of average incomes and risk across commodities is consistent with the implicit threat of pit migration.

SCALPER SPECIALIZATION

Working, Silber, and Smidt suggest that there is a separation between trader types, and that scalpers tend to specialize in a particular commodity rather than moving around the floor. Of course, some floor traders are limited through membership type to trading a subset of commodities on the floor.

Each representative scalper's daily volume is used for calculating mean and median daily trader volume. Table VII reports daily volume statistics per trader per day across markets. The first column combines all types of trading, *Own Account, House,* etc., by scalpers in their *home market.* The remaining columns give the mean volume per day in other commodity markets in which these scalpers trade. Clearly, for most commodities, scalpers trade predominantly in their *home market.* The exception is FCAT, which is among the least actively traded commodities. This could be an indication that scalpers in less active commodities cannot earn sufficient income in that one commodity, and hence, must trade a portfolio of commodities.

In Table VIII scalper volume is broken down by customer type as well as summarized overall. The first two columns of the table show the daily mean and median volume of trading of all types by scalpers by *home market.* In the remaining columns volume is divided by customer type. In all cases, the calculated means and medians include values of zero if a scalper for that *home market* does not trade in a given category on a given day.

Table VII
TRADING ACROSS COMMODITIES BY SCALPERS
TRADER-DAY MEAN AND MEDIAN VOLUME, ALL CUSTOMER TYPES, ALL EXPIRATIONS

Home Market	*Home Market* Median Volume	Mean Volume											
		POUND	CAN$	DMARK	SFRANC	YEN	TBILL	EURO$	S&P	LCAT	HOGS	BELLIES	FCAT
POUND	220	388	0	38	6	3	0	0	0	0	0	0	0
CAN$	287	0	500	0	0	0	0	0	0	0	0	0	0
DMARK	196	0	0	297	4	2	0	1	3	0	0	0	0
SFRANC	186	2	0	9	322	2	0	0	0	0	0	0	0
YEN	136	0	0	5	2	228	0	0	0	0	0	0	0
TBILL	164	0	0	0	1	0	481	5	0	0	0	0	0
EURO$	348	0	0	0	0	0	0	646	0	0	0	0	0
S&P	74	0	0	0	0	0	0	15	124	0	0	0	0
LCAT	224	0	0	0	0	0	0	5	0	363	6	0	2
HOGS	178	0	2	14	0	0	0	0	0	11	324	1	0
BELLIES	49	15	0	0	0	7	0	1	0	2	1	119	2
FCAT	87	0	0	0	0	0	0	0	0	17	55	2	128

A trader-day is the trading by a marketmaker on a particular day. There is one observation for each marketmaker each day.

Table VIII
SCALPER VOLUME
TRADER-DAY MEAN AND MEDIAN VOLUME ALL COMMODITIES, ALL EXPIRATIONS

	Total Daily Volume		*Own Account*		Volume by Customer Type		
Home Market	Mean	Median	Mean	Median	*House Account* Mean Volume	*Other Floor* Mean Volume	*Customer* Mean Volume
POUND	436	279	265	184	23	5	143
CAN$	503	288	152	128	85	15	250
DMARK	308	206	233	180	12	16	46
SFRANC	337	200	181	126	15	27	114
YEN	237	144	168	114	11	11	47
EURO$	646	349	613	336	7	19	7
TBILL	487	166	159	121	93	19	217
S&P	139	76	130	72	1	1	7
LCAT	377	237	153	78	20	25	180
HOGS	352	204	233	134	2	26	91
BELLIES	147	60	80	43	3	7	58
FCAT	201	110	140	74	1	10	50

A trader-day is the trading by a marketmaker on a particular day. There is one observation for each marketmaker each day.

Table VIII provides insight into similarities and differences between scalpers in the various commodities. Column 2 of the table shows that median daily volume in all customer types roughly follows the average daily volume ordering of commodities seen in Table I. That is, conditional on the selection procedure, scalpers who trade in high volume markets tend to trade more heavily than scalpers in lower volume markets. There are, however, two notable exceptions. While the average daily volume of trading in the CAN$ market is ranked 10th overall during the sample period, the scalpers in this market rank 2nd in terms of median total daily income. This level of scalper participation is in line with the other currency markets. This suggests that the number of scalpers in this group of markets adjusts so as to maintain a certain level of trading among scalpers. The opposite relationship is seen in the S&P market where a median total daily volume of 76 ranks this market 11th in terms of trading by scalpers while it ranks 2nd in terms of overall volume. Recall that the largest number of scalpers is identified in the S&P pit. It appears from these two observations that the large volume of trading in S&P futures attracts a large number of scalpers to the pit. This can be taken as evidence that the competition generated by this large number of traders reduces the potential for trading in the market. Alternatively, traders may be less willing to take on large positions, thereby inducing a greater number of traders to trade in the market. The analysis to determine which hypothesis holds, however, is beyond the scope of this article.

Table VIII also reveals how scalpers tend to allocate their activity among *Own Account* and *House, Other Floor* and *Customer.* Mean and median *Own Account* volume appear in columns 3 and 4 of the table, by *home market. Own Account* trading is the highest volume category. The median volumes for *House, Other Floor,* and *Customer,* not reported in the table, are almost always 0, indicating that most of the identified traders, on most days, trade mainly for *Own Account.* The mean volumes for *House, Other Floor,* and *Customer* volume are low relative to the volume of *Own Account* trading. The occasional high mean volume, particularly in *Customer* volume, in combination with small median volumes, reveals that scalpers infrequently execute trades for other participants in the market. While scalpers may engage in significant "dual trading" (principal and agent) within or across days, it is, nonetheless, not a common practice. This finding is consistent with Working and Silber, who maintain that scalpers tend to specialize in marketmaking. The differences between mean and median volume in columns 1 and 2, as well as the similar *Own Account* results in columns 3 and 4, also suggest that the markets are subject to infrequent high volume days. To a lesser extent, the spread between these two measures may be indicative also of a few significantly larger volume traders operating in a market.

An indication of the extent to which scalpers diversify their activity on a daily basis is provided in Table IX. For example, the *home market* statistics for FCAT scalpers show that, on average, scalpers execute 78% of their trades for their *Own Account,* less than 1% for *House Account,* 6% for *Other Floor,* and 15% for *Customer.* In general, the selected scalpers expend most of their effort in *Own Account* trading, evidenced by the high means and medians found in columns 1 and 2. Two exceptions to this are the CAN$ and LCAT markets. On average, only 57% of the volume of trading by CAN$ scalpers and 53% of the volume of trading by LCAT scalpers in their *home market* is *Own Account.* Most of the remaining volume of trading by scalpers in these markets, 31% in CAN$ and 37% in LCAT, is done for *Customer.* These figures suggest that dual trading by active scalpers, on a daily basis, takes place more in these markets than in other commodities. The statistics for all commodity trading, columns 9 through 16, show that, to the extent that scalpers trade in markets other than their *home market* (recall from Table VII that scalpers do little trading in other markets) they tend to trade in a manner similar to their

Table IX
SCALPER INTRADAY DIVERSIFICATION
TRADER-DAY MEAN AND MEDIAN VOLUME, BY CUSTOMER TYPES

	Daily Trading Percentages															
	Home Market Trading								All Commodity Trading							
	Own Account		*House Account*		*Other Floor*		*Customer*		*Own Account*		*House Account*		*Other Floor*		*Customer*	
Home Market	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
POUND	79	100	3	0	<1	0	18	0	80	100	3	0	1	0	16	0
CAN$	57	45	9	0	2	0	31	28	57	44	9	0	2	0	31	28
DMARK	93	100	1	0	2	0	4	0	92	100	1	0	2	0	5	0
SFRANC	80	100	2	0	3	0	15	0	80	100	2	0	3	0	15	0
YEN	90	100	2	0	2	0	7	0	89	100	1	0	2	0	8	0
EURO$	96	100	1	0	2	0	1	0	96	100	<1	0	2	0	1	0
TBILL	68	98	8	0	3	0	20	0	68	97	9	0	3	0	21	0
S&P	98	100	<1	0	<1	0	1	0	97	100	<1	0	<1	0	2	0
HOGS	53	41	4	0	6	0	37	33	52	40	4	0	5	0	38	38
HOGS	77	100	<1	0	4	0	19	0	77	100	<1	0	4	0	18	0
BELLIES	80	100	<1	0	3	0	16	0	77	100	1	0	4	0	18	0
FCAT	78	97	<1	0	6	0	15	0	79	99	<1	0	6	0	15	0

Percentages are rounded to the nearest integer. However, a 0 mean indicates a lack of trading in a particular category, while <1 signifies a fraction of a percent less than 0.5.

trading in their *home market.* This is evidenced by the similarities in the *home market* and all commodity means and medians.

CONCLUSIONS

This research paints a rough picture of scalper activity on the floor of a futures exchange. Prior research has defined scalpers as floor traders trading for their own account in such a fashion as to generate income from the asynchronous order flow from customer accounts. Floor traders are generally free to allocate their time among scalping, other speculative trading, and customer brokering. Scalpers are under no obligation to continually bid or offer, or to make an orderly market, or even to remain in any particular trading pit within their allowable trading set. The analysis shows that (1) there are floor traders on futures exchanges who earn significant income from trading strategies consistent with scalping; (2) scalper income distributions vary across commodities on an exchange; (3) median scalper incomes and the interquartile range of income are positively correlated; and, (4) a representative set of scalpers does little speculating outside their *home market,* and little brokering.

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