Performance Analysis using Stock Holdings: Insider Trades

Professor B. Espen Eckbo

2010

Contents

1 Bias in Return-Based Performance Measures

1. Timing and Private Information

- It is widely believed that corporate insiders possess private information about the firm's future cash flow that is not reflected in the company's stock price
- This information asymmetry gives rise to a number of market responses, ranging from widening bid-ask spreads to stock price reductions in response to firm-initiated trades such as public security issues
- Outside investors also demand protection by requiring rapid disclosure of individual insiders' trades, prohibiting "short-swing" profits, and by severely penalizing trades deemed to be based on material inside information
- Numerous studies have examined whether there is evidence that U.S. insiders systematically trade on private information despite the legal deterrence. The consensus appears to be that insider purchases (but not sales) tend to be followed by positive abnormal stock price performance, particularly for small growth stocks
- For example, Seyhun (1986) and Jeng, Metrick, and Zeckhauser (2003) report average abnormal returns of approximately 3% over a five-month holding period following insider purchases. Adjusting for size and book-

to-market ratio, Lakonishok and Lee (2001) find that the decile portfolio with the most intensive insider purchases outperform the lowest-decile portfolio by approximately 5% over a 12-moth holding period

- Two important problems with these returns-based performance studies

  1. The Holding Period Problem
  2. The Nonstationarity Problem

1. The Holding Period Problem

- Absent data on stock holdings, you do not know the actual time period an insider were holding a particular stock
- Thus, studies of portfolio returns in either event time or in calendar time must presume a portfolio holding period
- For example, you presume the holding period is one year for all insiders and test whether they would have made (risk-adjusted) profits that way. So, you purchase (or short) stocks bought (or sold) by insiders and hold the stock position for a period of one year. Now, if the actual holding period for any given insider differs from one year, then you are not replicating the actual return realized by the insider, and your inferences from this experiment with respect to insiders' profits will be wrong

2. The Nonstationarity Problem

- The key to realizing gains from private (inside) information is to change your stock holdings so as to "buy low and sell high". You are essentially timing the market (on an individual stock basis). This in turn means that the risk exposure of the insider's stock portfolio is necessarily time-varying

- If insiders in fact use private information to "buy low and sell high", then the weights in the insider portfolio will be positively correlated with future abnormal portfolio returns. The information in this correlation structure is missing in standard returns-based performance measures

- Omitting the information in the correlation structure biases downwards the constant term (Jensen's alpha) in the time series regressions of portfolio returns on risk

- Cornell (1979), Copeland and Mayers (1982), and Grinblatt and Titman (1989) propose weight-based measures to capture the true performance of actively managed portfolios. Eckbo and Smith (1998) develop a conditional versions of the Grinblatt-Titman weight-based measure and apply the measure to a portfolio of insider holdings on the Oslo Stock Exchange

2 The Portfolio Weight Measure of Performance

2.1 The "insider portfolio"

- Let $\mathbf{w}' = (w_1, ..., w_N)$ denote the vector of individual firm weights across N firms in the "insider portfolio". The typical element in this vector, w_i, is the aggregate holding of insiders in firm i

- As insiders in firm i trade, w_i changes to reflect the net effect of insider sales and purchases. This weight-change cancels out simultaneous trades in opposite directions by insiders in a given firm (which do not reflect inside information)

- The research question: What is the risk-adjusted return on a dollar invested in the insider portfolio?

- The insider portfolio itself is neither feasible nor individually optimal. It is infeasible for outsiders since insider trades are not publicly disclosed until the following month. It is also not optimal, because it is constructed from decentralized trade decisions at the individual firm level, and because individual insiders do not constrain their personal portfolio choices to the set of firms where they are insiders

- If decentralized insider trading on private information is pervasive, the aggregate value of the private information will be reflected in the portfolio's returns

- The abnormal performance of this portfolio is of particular interest to uninformed investors or mutual fund managers actively trading in broad-based stock portfolios, and whose investment decisions depend on the expected loss from trading against informed insiders

- The insider portfolio requires that the weights sum to one. Two weighting schemes used by Eckbo and Smith (1998):

$$\text{Value Weights} : \mathrm{w_i^h} \equiv h_i / \sum_{i=1}^{N} h_i, \tag{1}$$

$$\text{Ownership Weights } \mathrm{w_i^s} \equiv (s_i/S_i) / \sum_{i=1}^{N} (s_i/S_i). \tag{2}$$

  h_i = total market value of all insiders' holdings in firm i

  S_i (and s_i) = total number of shares outstanding (and the number of shares held by insiders) in firm i

- The value weights $\mathbf{w^h}$ assign greater weight to firms with relatively large dollar values of insider investment. The ownership weights $\mathbf{w^s}$ gives greater weight to relatively large insider ownership, in percent of shares outstanding. Thus, for a given dollar value of insider investment, the ownership-weighted portfolio gives greater weight to smaller firms

- The portfolio weights in Eq. (1) and Eq. (2) are subject to change even in the absence of insider trades
  - $\mathbf{w^h}$ capture changes in the market prices of the underlying stocks. However, these changes will not reflect private information and thus are uncorrelated with future abnormal stock returns
  - $\mathbf{w^s}$ capture changes in shares outstanding, such as stock splits and equity issues

2.2 The Covariance Measure

- Absent superior information and assuming expected returns are constant, average covariances of portfolio weights with future returns should be zero:

$$\sum_{i=1}^{N} cov(w_{it}, r_{i,t+1}) = \sum_{i=1}^{N} E[(w_{it} - E[w_i])(r_{i,t+1} - E[r_i])] = \sum_{i=1}^{N} E[w_{it}(r_{i,t+1} - E[r_i])] = 0, \tag{3}$$

  where w_{it} is the portfolio weight of asset i selected at time t and held from time t through $t+1$

- Insiders with superior information will generate a positive estimate of equation (3) since they are able to correlate this period's trade with next period's return

- Eckbo and Smith (1998) estimate Eq. (3) using conditioning information, i.e., publicly available information that may be useful in forecasting

returns. Thus, they test whether portfolio weights are correlated with the unforecastable portion of portfolio returns

- When estimating Eq. (3) in the level of the portfolio weights, the estimation includes returns in periods of insider trading as well as periods when there was no trading, resulting in an average monthly performance measure

- When estimating Eq. (3) using the change in the weights, you "zero out" periods of nontrading, producing a marginal performance estimate

- The difference between the average and marginal performance estimates lies in the impact on portfolio returns of months with zero change in insider holdings

- If a decision *not* to trade also reflects inside information, then the average performance estimate has greater power to detect superior performance. This is also the relevant portfolio concept for an analysis of the expected loss to outsiders from trading against insiders, and for comparing the performance of insiders to the performance of managed portfolios such as mutual funds

- On the other hand, the possibility of loss of significant corporate control benefits may cause the typical insider not to trade except when inside information is particularly valuable. In this case, the marginal or

trade-based performance concept has greater power to register abnormal performance

3 Eckbo and Smith (1998): Insider Trades on the Oslo Stock Exchange

3.1 Why the Interest in the OSE

- About 200 listed firms 1985–1993
- Insiders own approximately 18% of the stocks in the firms traded on the OSE
- First-generation insider trading laws, and virtually no enforcement of these laws over the sample period
- High volatility (due to resource stocks) makes it simpler to hide trades based on inside information
- Notion that "If you don't see profits from insider trades here, you probably won't see it anywhere"

3.2 Data

- The empirical analysis use all reported insider trades, where "insiders" including the CEO, the top managers of the firm, members of the board

of directors and supervisory boards, the firm's auditor and investment advisor, and close family members of these individuals

- The trade report provides the trade trade, the security traded, the trade amount, the direction of trade (purchase or sell), and the stock price per share of the transaction

- Total data base consists of 18,301 insider trade records in 247 securities 1985–1992, for the population of 24,369 insiders

- The insiders' stock holdings each month reconstructed recursively using complete data on holdings at the end of the sample period and the trade history backwards

- Of the 18,301 trades, 35 percent are sales. The monthly change in the holdings includes a maximum net sale of approximately 1.5 percent and a maximum net purchase of approximately 1.7 percent of the company's stock. Over the sample period, insiders on average traded 26 percent of the value of their total holdings per year. The turnover rate over the same period for the average OSE stock was 35 percent

- Insiders purchased approximately 0.5 percent and 1.0 percent of the stocks in the "crash" months of October and November of 1987, respectively, when the OSE market index experienced significant declines of 26 percent and 19 percent

- The study computes the performance (using stock holdings) of the seven largest mutual funds on the OSE as a comparison

3.3 Summary of Empirical Results

- Tables are summarized and numbered as in Eckbo and Smith (1998)

1. Event Study

- Seven-month event window (months 0 through +6). Some evidence of abnormal price declines in months +3 and +4 following net sales when using a simple market model approach to compute abnormal returns

- No evidence of significant abnormal returns when using a conditional framework (where risk factors are predicted using publicly available information in the previous month)

2. Jensen's Alpha

- Aplha-estimates not significantly different from zero for the total insider portfolio nor subportfolios defined using large/medium/small weights and large/medium/small trades (weight changes). This holds whether using value-weights or ownership weights

- Jensen's alpha not significantly different from zero for the portfolio of the seven largest mutual funds on the OSE. However, the alpha of the fund is significantly greater than the alpha of the insider portfolio

3. Portfolio Weight Measure

- The portfolio weight measure is small and insignificant across all definitions of the insider portfolio
- The portfolio weight measure is small and insignificant across the seven mutual funds as well

Table III
Average Monthly Abnormal Returns to Insider Trades: Conditional Event Study Approach, Oslo Stock Exchange, 1985:1 - 1992:12.

Type of Trade	**Average monthly abnormal return, $\hat{\mu}_i$, i = month 0,.., month 6 (p-value)**						
	$\hat{\mu}_0$	$\hat{\mu}_1$	$\hat{\mu}_2$	$\hat{\mu}_3$	$\hat{\mu}_4$	$\hat{\mu}_5$	$\hat{\mu}_6$
Panel A. Unconditional one-factor market model with equal weights							
All trades	-0.004 (0.102)	-0.012 (0.328)	-0.020 (0.033)	-0.018 (0.024)	-0.027 (0.014)	-0.017 (0.153)	-0.010 (0.492)
Net buys only	-0.015 (0.421)	-0.009 (0.926)	-0.022 (0.145)	-0.015 (0.421)	-0.014 (0.626)	-0.024 (0.045)	-0.009 (0.768)
Net sales only	0.008 (0.001)	-0.015 (0.088)	-0.018 (0.165)	-0.021 (0.050)	-0.040 (0.000)	-0.010 (0.213)	-0.011 (0.933)
Panel B. Conditional multifactor model with value weights (ω_{it}^h)							
All trades	0.019 (0.152)	0.013 (0.336)	0.007 (0.554)	-0.002 (0.608)	-0.007 (0.965)	0.007 (0.472)	0.018 (0.282)
Net buys only	0.004 (0.556)	0.008 (0.508)	0.008 (0.761)	0.009 (0.219)	-0.018 (0.679)	0.023 (0.264)	0.023 (0.453)
Net sales only	0.035 (0.029)	0.018 (0.418)	0.005 (0.643)	-0.012 (0.642)	0.004 (0.707)	-0.009 (0.982)	0.013 (0.249)
Panel C. Conditional multifactor model with ownership weights (ω_{it}^s)							
All trades	0.051 (0.002)	0.013 (0.312)	0.001 (0.940)	-0.003 (0.745)	0.009 (0.557)	0.015 (0.763)	0.040 (0.084)
Net buys only	0.005 (0.848)	0.024 (0.323)	-0.010 (0.703)	-0.004 (0.685)	-0.012 (0.961)	0.015 (0.669)	0.029 (0.380)
Net sales only	0.097 (0.000)	0.003 (0.898)	0.013 (0.591)	-0.001 (0.991)	0.031 (0.294)	0.015 (0.867)	0.050 (0.072)

Table V
GMM Estimates of a Conditional Asset Pricing Model Benchmark Applied to Portfolios of Insider Holdings on the Oslo Stock Exchange, 1985:1 - 1992:12

Portfolio	**Mean monthly raw return [St.dev.]**	$\hat{\alpha}_p$	$\hat{\alpha}_p^*$	**Constant beta estimates** *dxmsci*	*rnibor*	*dterm*	**Goodness of-fit test**[1]
Panel A. Portfolios formed using value weights (ω_{it}^h)**.**							
All securities	-0.005 [0.073]	-0.001 (0.893)	-0.011 (0.079)	0.558 (0.002)	0.160 (0.055)	0.205 (0.003)	12.321 (0.420)
Large weights only	-0.018 [0.119]	-0.007 (0.575)	-0.030 (0.005)	0.748 (0.003)	0.327 (0.005)	-0.059 (0.633)	11.249 (0.508)
Medium weights only	-0.012 [0.085]	-0.019 (0.036)	-0.015 (0.073)	0.434 (0.004)	0.004 (0.973)	0.251 (0.011)	3.807 (0.926)
Small weights only	0.002 [0.069]	0.005 (0.405)	0.007 (0.189)	0.578 (0.000)	0.205 (0.006)	0.346 (0.000)	8.210 (0.769)
Large trades only	0.018 [0.209]	0.031 (0.148)	0.015 (0.352)	0.782 (0.015)	0.093 (0.557)	0.603 (0.011)	14.644 (0.261)
Medium trades only	0.002 [0.071]	0.002 (0.820)	-0.008 (0.139)	-0.019 (0.831)	-0.052 (0.426)	0.115 (0.131)	12.233 (0.427)
Small trades only	-0.005 [0.071]	-0.002 (0.808)	-0.009 (0.124)	0.439 (0.008)	0.159 (0.056)	0.227 (0.004)	9.950 (0.620)
Buys only	-0.012 [0.089]	-0.010 (0.240)	-0.017 (0.022)	0.621 (0.006)	0.269 (0.010)	0.179 (0.028	7.849 (0.797)
Sales only	0.002 [0.091]	-0,004 (0.639)	-0.001 (0.910)	0.752 (0.000)	0.305 (0.004)	-0.009 (0.891)	7.578 (0.817)

Portfolio	**Mean monthly raw return [St.dev.]**	$\hat{\alpha}_p$	$\hat{\alpha}_p^*$	**Constant beta estimates** *dxmsci*	*rnibor*	*dterm*	**Goodness of-fit test**[1]
Panel B. Portfolios formed using ownership weights (ω_{it}^s)**.**							
All securities	-0.010	-0.010	-0.008	-0.266	0.315	0.330	16.293
	[0.108]	(0.389)	(0.466)	(0.099)	(0.003)	(0.005)	(0.178)
Large weights only	-0.034	-0.029	-0.053	-0.051	0.347	0.139	17.958
	[0.201]	(0.131)	(0.007)	(0.894)	(0.111)	(0.518	(0.117)
Medium weights only	0.007	0.009	-0.010	0.012	0.006	0.002	14.883
	[0.101]	(0.459)	(0.004)	(0.494)	(0.743)	(0.947)	(0.295)
Small weights only	0.008	0.009	0.001	0.366	-0.032	0.327	4.698
	[0.077]	(0.367)	(0.924)	(0.000)	(0.589)	(0.000)	(0.967)
Large trades only	0.004	-0.004	-0.019	0.255	-0.077	0.348	9.020
	[0.185]	(0.823)	(0.105)	(0.191)	(0.662)	(0.090)	(0.701)
Medium trades only	-0.007	-0.002	-0.009	0.065	0.034	0.060	13.017
	[0.099]	(0.847)	(0.083)	(0.698)	(0.589)	(0.288)	(0.368)
Small trades only	-0.014	-0.011	-0.012	-0.102	0.134	0.428	12.451
	[0.103]	(0.312)	(0.206)	(0.519)	(0.112)	(0.002)	(0.410)
Buys only	-0.006	0.003	-0.007	0.064	0.259	0.348	17.307
	[0.160]	(0.855)	(0.501)	(0.804)	(0.131)	(0.062	(0.138)
Sales only	-0.009	-0.012	-0.016	0.449	0.329	-0.088	7.681
	[0.083]	(0.126)	(0.020)	(0.009)	(0.005)	(0.305)	(0.681)

Table VI
Conditional Portfolio Weight Measure of Performance of Portfolios of Insider Holdings on the Oslo Stock Exchange, 1985:1 - 1992:12.

Portfolio	**Portfolios with value weights** (ω_{it}^{h})	**Portfolios with ownership weights** (ω_{it}^{s})
All securities	-0.006	-0.002
	(0.358)	(0.797)
Large weights only	-0.007	0.002
	(0.467)	(0.921)
Medium weights only	-0.013	-0.001
	(0.101)	(0.286)
Small weights only	-0.004	-0.002
	(0.540)	(0.766)
Large trades only	0.007	-0.001
	(0.539)	(0.964)
Medium trades only	-0.003	-0.003
	(0.379)	(0.754)
Small trades only	-0.007	-0.004
	(0.349)	(0.660)
Buys only	-0.007	-0.002
	(0.371)	(0.863)
Sales only	0.000	-0.004
	(0.988)	(0.644)

Table VII
Coefficients in regressions of Conditional Portfolio Weight Measure of Performance on Time-Series Characteristics, for Insider Trades on the Oslo Stock Exchange, 1985:1 - 1992:12.

This table presents OLS estimates of coefficients α in the following regression:

$$\hat{\Phi}_{p,t+1} = \alpha_0 + \alpha_1 \hat{\Phi}_{pt} + \alpha_2 jdum_t + \alpha_3 crash_t + \alpha_4 own_t + \alpha_5 down_t + \epsilon_{p,t+1},$$

where $\hat{\Phi}_{p,t+1} \equiv \sum_{i=1}^{N_p} \omega_{it} \hat{u}1_{i,t+1}$ is the estimate of the conditional portfolio weight measure for month $t+1$, $\hat{u}1_{i,t+1}$ is the residual from the regression of the excess return on security i $r_{i,t+1}$ on the information variables $\mathbf{Z_t}$ (including a constant), ω_{it} is the portfolio weight of security i at the end of period t, and N_p is the number of securities in portfolio p. Moreover, own_t is the average shares held by insiders in the 230 securities in the sample in month t, $down_t$ is $own_t - own_{t-1}$, and $crash_t$ is a dummy variable taking on the value of one in October, 1987, and zero otherwise, and $\epsilon_{p,t+1}$ is a mean zero error term. See Table I for definitions of $\mathbf{Z_t}$ and the value- and ownership weights. The p-values for the coefficient estimates, which are given in parentheses, are computed using White's (1980) heteroscedastic-consistent estimator for standard errors.

Portfolio weight formed using:	α_0	α_1	α_2	α_3	α_4	α_5	**Adj.** R^2
Value weights (ω_{it}^h)	0.031	0.147	-0.039	-0.230	-0.215	0.835	0.102
	(0.391)	(0.175)	(0.067)	(0.000)	(0.390)	(0.515)	(0.012)
Ownership weights (ω_{it}^s)	-0.018	-0.005	-0.003	0.023	0.390	0.515	-0.054
	(0.781)	(0.968)	(0.960)	(0.498)	(0.786)	(0.753)	(0.999)

Table VIII
GMM Estimates of a Conditional Asset Pricing Model Benchmark Applied to Seven Mutual Funds on Oslo Stock Exchange, 1985:1 - 1992:12

Mutual Fund/ Portfolio	**Mean monthly raw return [St.dev.]**	$\hat{\alpha}_p$	$\hat{\alpha}_p^*$	**Constant beta estimates** *dxmsci*	*rnibor*	*dterm*	**Goodness of-fit test**[1]
AVEM	0.008	0.011	0.009	0.448	0.230	0.171	10.504
	[0.061]	(0.029)	(0.050)	(0.002)	(0.004	(0.016)	(0.572)
KAGM	0.006	0.007	0.004	0.424	0.224	0.103	7.025
	[0.067]	(0.195)	(0.425)	(0.004)	(0.005)	(0.121)	(0.856)
KVTM	0.004	0.005	0.004	0.380	0.252	0.069	8.109
	[0.070]	(0.353)	(0.420)	(0.008)	(0.005)	(0.346)	(0.747)
NAKM	0.005	0.008	0.007	0.431	0.217	0.162	6.597
	[0.066]	(0.147)	(0.180)	(0.002)	(0.001)	(0.033)	(0.883)
NOFM	0.005	0.010	0.007	0.419	0.232	0.167	11.979
	[0.068]	(0.073)	(0.171)	(0.003)	(0.005)	(0.024)	(0.447)
NOPM	0.006	0.010	0.007	0.492	0.212	0.191	8.851
	[0.065]	(0.061)	(0.168)	(0.001)	(0.006)	(0.008)	(0.716)
SPIM	0.005	0.007	0.006	0.375	0.232	0.169	9.595
	[0.061]	(0.153)	(0.168)	(0.006)	(0.003)	(0.016)	(0.651)
Avg. Mutual	0.006	0.007	0.006	0.356	0.193	0.120	8.726
Fund	[0.055]	(0.114)	(0.169)	(0.003)	(0.004)	(0.042)	(0.726)
Difference portfolio, (ω_{it}^h)	0.011	0.008	0.013	-0.043	0.060	-0.112	13.335
	[0.043]	(0.160)	(0.008)	(0.526)	(0.272)	(0.008)	(0.345)
Difference portfolio, (ω_{it}^s)	0.017	0.016	0.020	0.026	0.019	-0.251	15.307
	[0.098]	(0.108)	(0.038)	(0.909)	(0.854)	(0.035)	(0.235)

Table IX
Conditional Portfolio Weight Measure of Performance applied to Mutual Funds on the Oslo Stock Exchange, 1985:1 - 1992:12.

Covariance Measure	**Mutual Fund**						
	AVEM	**KAGM**	**KVTM**	**NAKM**	**NOFM**	**NOPM**	**SPIM**
$\hat{\Phi}_p$	0.000	-0.001	-0.002	-0.001	0.000	-1.086	0.000
	(0.994)	(0.973)	(0.895)	(0.949)	(0.977)	(0.966)	(0.991)

References

Copeland, Tom, and David Mayers, 1982, The Value Line enigma (1965-19768): A case study of performance evaluation issues, *Journal of Financial Economics* 10, 289–321.

Cornell, Bradford, 1979, Asymmetric information and portfolio performance measurement, *Journal of Financial Economics* 7, 381–390.

Eckbo, B. Espen, and David C. Smith, 1998, The conditional performance of insider trades, *Journal of Finance* 53, 467–498.

Grinblatt, Mark, and Sheridan Titman, 1989, Mutual fund performance: An analysis of quarterly portfolio holdings, *Journal of Business* 62, 393–416.

Jeng, Leslie A., Andrew Metrick, and Richard Zeckhauser, 2003, Conditional performance measurement using portfolio weights: Evidence for pension funds, *Review of Economics and Statistics* forthcoming.

Lakonishok, Josef, and Inmoo Lee, 2001, Are insiders' trades informative?, *Review of Financial Studies* 14, 79–111.

Seyhun, H. Nejat, 1986, Insiders' profits, costs of trading and market efficiency, *Journal of Financial Economics* 16, 189–212.

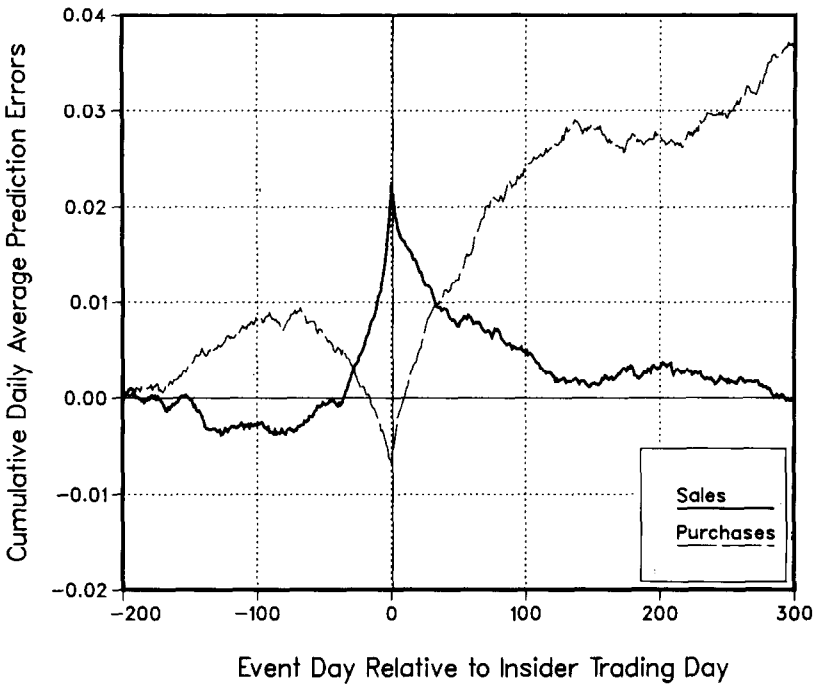

Fig. 1. Cumulative daily average prediction errors from 199 days before to 300 days after the insider trading day, for a portfolio of 769 firms traded by insiders during 1975 to 1981, separated by sale and purchase transactions.

Insiders' abnormal profits do not appear to be especially large. However, insider trading is regulated by the Securities and Exchange Act of 1934. Insiders can be sued for violating their fiduciary responsibilities to their shareholders if they trade on material non-public information prior to the public announcement of the information.[9] Consequently, insiders would not be expected to trade for their own account immediately prior to highly profitable but also publicized corporate events such as mergers and tender offers.

Estimates of insiders' abnormal profits presented in table 2 are smaller than the estimates in the previous insider trading studies. For example, Jaffe (1974) estimates insiders' gross abnormal profits to be 2% over two months and 5%

[9]Section 10 of the Securities and Exchange Act of 1934 prohibits fraud in purchase or sale of securities. Section 16(a) requires the reporting of insiders' transactions. Section 16(b) requires the profits from purchases and sales within six months of each other to be returned to the corporation. Section 16(c) prohibits short sales by insiders. Section 32 as amended in 1975 provides penalties up to $10,000 fine and five years of imprisonment for violating any provision of the securities law.