Managerial Trading Activities and Firm Valuation:
Long-Run Performance Evidence for U.S. Firms

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First Draft

January 2010

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Abstract

We analyze the long-run stock market performance of U.S. firms experiencing managerial insider transactions. Our sample starts with the enforcement of the corresponding Sarbanes-Oxley legislation change in August 2003 and consists of more than 176,000 insider trades of all firms traded on NASDAQ, AMEX, and the NYSE. Our results reveal that insider buy transactions exhibit positive private information and precede short-run and long-run abnormal returns. Surprisingly, insider sales do not contain negative private information. We document that companies with insider sale transactions earn significant positive Buy-and-Hold abnormal returns until the third anniversary after insider trades. Assuming that insider sale transactions are a proxy for equity-based compensation, this finding suggests that firms with equity-based compensation outperform firms without equity-based compensation.

1. Introduction

Insider trading is regulated in the United States since 1934. The Securities Act of 1933 and the Securities Exchange Act of 1934 where enacted after the crash in 1929. In recent years, insider trading regulation has been tightened. In 2002, new rules and amendments were adopted to Section 16 of the Securities Exchange Act implementing the provisions of the Sarbanes-Oxley Act of 2002. Section 16(a) now states that insiders are forced to disclose their transaction 'before the end of the second business day following the day on which the subject transaction has been executed'. This tightening results in a dramatic reduction of the notification period. Previously, the notification of insider transactions had to be carried out by the tenth day of the following month, leading to a notification period of up to 40 days. The current regulation is comparable to most European Union countries, where insider transactions have to be publicly disclosed shortly after the transaction[1].

The information content of insider transactions has been of interest to academia since the 1970's, as Jaffe (1974), Finnerty (1976) and Seyhun (1986) document that insiders are able to earn significant abnormal returns. The studies by Lakonishok and Lee (2001), Jeng et al. (2003) and Fidrmuc et al. (2006) analyze insider trading in the United States using a pre-Sarbanes-Oxley dataset. Overall, they find that insider buy transactions contain positive information, whereas insider sell transactions do not contain negative private information. The studies provide evidence that the abnormal returns earned by insiders are due to the contrarian investment style adopted by insiders as well as their exploitation of private information.

Our contributions to the literature are as follows: First, we analyze the market reaction to the disclosure of managerial insider transactions in the United States after the Sarbanes-Oxley legislation change. Second, we analyze both short-term and long-run (up to three years) abnormal returns of insider transactions.

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[1]   See for example Dymke and Walter (2008), Betzer and Theissen (2009) for evidence on Germany, or Aussenegg and Ranzi (2008) for a multi-country study on insider transactions in continental Europe.

Our main findings are, first, that the information value of insider buy transactions is positive, as markets react immediately to the filing of insider buy transactions. Second, we find that the market fails to fully incorporate this information into prices. We document significant abnormal returns in the three-year period after insider buy transactions. Third, we show that the filing of insider sale transactions does not contain negative information, as we find no significant market reaction to the filing of insider sale trades in the short run. Fourth, for the three year period after the filing, we document significant positive abnormal returns also for insider sale transactions.

The paper is structured as follows. We begin in Section 2 by reviewing the literature and developing our research hypotheses. In Section 3 we describe our data collection procedure and the final dataset. In Section 4 we present the research design. In Section 5 we display our result and Section 6 concludes.

2. Literature Review and Hypotheses

Lakonishok and Lee (2001) observe little market movement when insiders trade and when they file their trades to the SEC. Jeng et al. (2003) inspect the returns earned by insiders. They document that insider purchases are followed by abnormal returns of more than 6% per year, whereas insider sales do not earn significant abnormal returns. Fidrmuc et al. (2006) compare the market reaction to insider transactions in the United States and in the U.K. They find a more pronounced market reaction in the U.K. and attribute this to the speedier reporting of insider transactions in the U.K. Fahlenbrach and Stulz (2009) analyze managerial ownership dynamics and report that increases in managerial ownership enhance Tobin's q, whereas decreases in managerial ownership do not lower Tobin's q. Informational advantage is an incentive for insiders to buy shares of their company. We expect that the reduced filing period in the United States affects the significance of abnormal returns after buy transactions.

Hypothesis 1a: *Insider buy transactions reveal positive private information and lead to significant short-run positive abnormal returns.*

Due to the short-swing profit rule insider buy shares with long-run information value. Because of information uncertainty and inefficiencies markets fail to immediately incorporate this information into stock prices. This leads to the following hypothesis:

Hypothesis 1b: Insider buy transactions lead to significant positive long-run abnormal returns.

Beginning with Jensen and Meckling (1976) there is a growing literature studying the determinants and effects of managerial ownership. Managerial ownership and equity compensation can be a mean to align management's actions with owners' interests. This implies that managers are exposed to their firm's risk by (i) their employment, and by (ii) their stock holdings. Hence, we assume that a large proportion of insider sale transactions is caused by liquidity needs and the desire for diversification. In part, the insignificance of (short-run) abnormal returns after insider sale transactions documented by Lakonishok and Lee (2001) and Jeng et al. (2003) is attributed to the more pronounced legal risk that is associated with insider sale transactions.

Therefore, we assume that the negative information inherent in insider sale transactions is small and expect no significant market reaction after insider sale transactions.

Hypothesis 2a: Insider sale transactions to not reveal negative private information and do not lead to significant negative short-run returns.

Agency theory suggests that firms can align the interests of managers with those of the firm through bonus contracts. Frequently, these contracts are based on firm performance. Sell transaction by corporate insiders outnumber insider buy transactions by far. For example, in our sample insider sale transactions account for 91.01% of all insider trades and 96.32% of the dollar volume of all insider transactions (see Table 1). This suggests that insider sale transactions proxy for stock based compensation. Hanlon et al. (2003) provide evidence that bonus contracts enhance firm value in the long-run.

Hypothesis 2b: Insider sale transactions proxy for stock based compensation and therefore they precede positive abnormal returns in the long run.

3. Sample Selection and Data Description

Our research period starts in August 2003 with the enforcement of significantly reduced insider trading disclosure requirements postulated by the corresponding Sarbanes-Oxley legislation and ends in October 2009.

3.1 Market Data

Our analysis covers NYSE/AMEX/NASDAQ firms with return data available in Thomson Datastream (TDS). We download historical market data for 6,754 companies. The TDS historical database contains active, inactive and delisted companies. Therefore, our sample is free of a survivorship based bias.

Ince and Porter (2006) compare return data available in TDS and in the University of Chicago's Center for Research in Securities Prices (CRSP) database. They find several sources of errors in TDS return data. We follow Ince and Porter (2006) and refrain from using the total return index data field provided by TDS. Instead, we calculate daily total returns in using adjusted prices and adjusted dividend data. We further carefully screen the TDS return data for outliers and eliminate daily returns above +50% or below -50%.

3.2 Insider Transactions

Section 16(a) of the Securities Exchange Act states that insider transactions have to be filed electronically to the Securities and Exchange Commission which, in turn, 'shall provide each such statement on a publicly accessible Internet site not later than the end of the business day following that filing'. Accordingly, since June 30th, 2003, corporate insiders must disclose their insider transactions using the SEC's electronic EDGAR system.

There are numerous data vendors that collect insider filings, process the information in the filings and provide the filings in a convenient format. We obtain our sample from the data provider InsiderCow[2] and download filings of open market insider transactions.

Our overall insider filings data sample starts in August 2003 and ends in October 2008. It contains filings by insiders from all NYSE/AMEX/NASDAQ traded firms with return data available in TDS during the research period.

We collect a total of 1,576,988 insider transactions, of which 205,184 are purchase and 1,370,804 are sale transactions. In order to check the validity of the data and to screen for data errors it proves necessary to conduct several data screens. A first source of error is the missing or false statement of trading dates, filing dates, traded share amounts or unit prices. In a first step we eliminate filings with missing or inconsistent information. Furthermore, we cross-check unit prices filed by insiders with the data on TDS and delete insider transactions whose trade price is not within 50% of the closing price on that day as reported by TDS. These two screens control for misstatements of insider transactions. The screens reduce our sample by about 17,000, or approximately 1% of the original sample. We then control for double counting of insider trades. If two or more insider trades are identical in all data fields, only one is kept in the database. This additional screen reduces the sample by less than 500 observations.

After this, we aggregate insider transactions having the same transaction date, filing date and filing entity. We argue that these transactions are caused by partial order execution and are therefore not attributable to a discretionary decision of insiders. We suppose therefore that these transactions do not contain additional information value. The resulting dataset contains 370,637 insider transactions, composed of 91,589 insider buy and 273,863 insider sale trades.

As we are interested in the effects of insider transactions on the stock market performance within the first three-years following the insider trading disclosure, we consider insider trades filed in the period from August 2003 to October 2006. This reduces our sample to 43,324 buy transactions, 177,290 sell transactions, and hence a total sample

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of 220,614. Section 16(a) of the Securities Exchange Act obligates insiders to electronically file their transactions within two trading days. From the 220,614 insider filings, more than 89% occur within the first two-trading days. We consider only insider filings that occur within two trading days after the transaction. This leads to a sample of 34,713 insider buy transactions and 163,039 insider sell transactions. Figure 1 shows the distribution of insider filings in relation to the duration of the filing period.

*** Insert Figure 1 about here ***

Our main focus is the relationship between firm value and managerial insider trading. Therefore, we lastly include only insider filings of directors and officers. This leaves us with a final sample of 28,578 buy and 148,370 sale transactions.

This final sample contains in total 472.3 million shares bought by directors and officers, with an overall dollar volume of 5,556.8 million USD. The average (median) insider buy transaction involves 16,526.35 (1,000) shares, with an average (median) dollar volume of 194,442.99 USD (16,680 USD). The number of total shares sold by corporate insiders amounts to 4,782.5 million, with a total volume of 145,312.6 million USD. The average (median) insider sale transaction involves 32,233.27 (7,500) shares and the corresponding average (median) volume is 979,393.19 USD (179,186.5 USD).

Hence, sale transactions by managers and directors exceed their buy transactions considerably. The ratio of shares bought and sold is 0.099 with a corresponding dollar volume ratio of 0.038. In addition, the mean price per share bought by directors and officers is 11.76 USD, whereas the average price per share sold is 30.38 USD. This suggests that managers are buying shares when they are relatively cheap.

*** Insert Table 1 about here ***

Our sample comprises managerial insider trading in 4,368 companies, which implies on average 40.51 insider transactions per company during the total sample period, or 1.04

insider transactions per month. Buy transactions are carried out in 3,254 companies. During the total sample period on average 8.78 buy transactions are executed per company, or 0.23 per company and month. Insider sale transactions are executed in 3,865 companies, 38.39 trades on average per company during the sample period, and 0.98 trades per company and month.

4. Methodology

4.1 Calendar-Time Portfolio Approach

We first use the calendar-time portfolio approach to measure long-run abnormal returns following insider transactions. This approach addresses the question whether or not firms with insider buy (sale) trades subsequently earn abnormal returns relative to a specific asset pricing model. The calendar-time portfolio approach was first used by Jaffe (1974) and Mandelker (1974). It is advocated by Fama (1998), and Mitchell and Stafford (2000) highlight its advantage over competing methods for long run excess return measurement.

The general idea behind this method is to create event portfolios in each period containing all firms that have experienced the event under research within the prior t periods. As Mitchell and Stafford (2000) point out, the event portfolio accounts for the cross-sectional correlation of the individual event firms in the portfolio variance. As the portfolio's excess return is regressed on an asset pricing model, this method is also a test of the validity of this asset pricing model: If the asset pricing model fails to perfectly model expected returns, the methods' results might be attributed to model misspecifications.

We separately create calendar-time portfolios for manager buy and manager sale transactions. To model expected returns, we use the three factors introduced by Fama and French (1993) and the momentum factor from Carhart (1997). All four factors are taken from Kenneth French's website. These factors are calculated regardless of insider trading activities. Hence, our portfolio of insider buy (sales) transactions is compared

through the asset pricing model to all firms, i.e., to firms with insider buys, to firms with insider sales, and to firms with no insider transactions.

The short filing period forces insiders to disclose their transactions promptly. To catch the market reaction immediately after the disclosure we start our investigation on the day after the disclosure. This results in the creation of a buy and a sale portfolio on each day. The portfolios contain all companies with an insider buy or sale filing within the last three years. That is, portfolios are rebalanced daily to include all firms that have disclosed insider transactions the day before and to drop all companies that reach the end of their 3-year period. If a company discloses several consecutive buy transactions in the 3-year period, the date of the last buy transaction is relevant for the inclusion into the buy portfolio. The same procedure applies to the sale portfolio. We compute daily equally weighted returns for both portfolios and regress the portfolio excess returns on the four factor model. For the buy portfolio this leads to the following equation:

$$R_{b,t} - R_{f,t} = \alpha + \beta_1 \cdot \left(R_{M,t} - R_{f,t}\right) + \beta_2 \cdot SMB_t + \beta_3 \cdot HML_t + \beta_4 \cdot UMD_t + \varepsilon_t \qquad (1)$$

With:

$R_{b,t:}$ Return of the buy portfolio on day t

$R_{f,t}$: Riskless return on day t

$R_{M,t}$: Market return on day t

SMB_t: Size factor (small minus big)

HML_t: Book-to-market factor (high minus low)

UMD_t: Momentum factor

The alpha intercept α measures the average daily abnormal return on the insider portfolios.

4.2 Buy-and-Hold Abnormal Returns (BHARs)

In addition to the calendar-time approach we estimate long-term abnormal performance also by using buy-and-hold abnormal returns (BHARs). This method was introduced to

empirical finance by Ritter (1991) and since then it gained widespread acceptance. Barber and Lyon (1997) state that BHARs accurately measures an investor's actual investment experience as it measures the return from a long-run investment strategy that is long in all firms that complete an event and short in an appropriate benchmark.

To calculate the benchmark's return, we use a control firm approach. In this approach, each sample firm, i.e., each firm with an insider transaction is matched to a control firm with no insider transactions during the whole period from August 2003 until October 2009. We have on average (median) 730.9 (712) companies per month with no insider filing during the whole period.

The matching is based on two firm characteristics, namely on the β-value calculated according to the market-model and on the market value. At the beginning of each month we use the previous 120 trading days to calculate the market-model β for each firm. Control firms are then grouped into 30 classes according to their β-value[3]. The matching of a sample firm to a control firm is carried out at the beginning of each month. The procedure consists of the following steps:

1. Calculate the β-value of the sample firm using the previous 120 trading days and find the corresponding β-value class.
2. In each β-value class, find the control firm for which
   $\mid$ market value$_{\text{sample firm}}$ - market value$_{\text{control firm}}\mid$ is minimal.

The holding period is 750 trading days (i.e., approximately three years). We adopt the calculation used by Loughran and Ritter (1995) and calculate the 750 trading day buy-and-hold abnormal returns as follows:

$$BHAR_{sample\ firm} = \prod_{t=start}^{\min(T,delist)}\left(1 + R_{sample\ firm,t}\right) - \prod_{t=start}^{\min(T,delist)}\left(1 + R_{control\ firm,t}\right) \qquad (2)$$

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[3] We use the following rule to form 30 monthly classes of control firms according to the β-value: $-2.0 <= \beta < 0$: step size is 0.2; $0 <= \beta < 1.0$: step size is 0.1; $1.0 <= \beta < 3.0$: step size is 0.2. At the beginning of each month control firms are put in their corresponding β-value classes. Firms with β-values smaller than -2.0 or greater than 3.0 are put in the respective boundary-classes.

where $R_{sample\ firm,t}$ is the daily sample firm return and $R_{control\ firm,\ t}$ is the daily control firm return, *start* is the first day after the filing of the insider transaction, and *min(T, delist)* is the earlier of the last trading day of the firm or the last day of the 750 trading day window.

Barber and Lyon (1997) document that long-run buy-and-hold abnormal returns have a positive skewness. We use the bootstrapping procedure as advocated by Lyon, Barber and Tsai (1999) to calculate bootstrapped skewness-adjusted t-statistics.

$$t_{sa} = \sqrt{N} \cdot \left(S + \frac{1}{3} \cdot \hat{\gamma} \cdot S^2 + \frac{1}{6 \cdot N} \cdot \hat{\gamma} \right) \tag{3}$$

with
$$S = \frac{Av.\ BHAR}{\sigma(BHAR)} \tag{4}$$

and
$$\hat{\gamma} = \frac{\sum_{i=1}^{N} (BHAR_i - Av.BHAR)^3}{N \cdot [\sigma(BHAR)]^3} \tag{5}$$

5. Empirical results

5.1 Managerial insider transactions and firm size

For the total sample of 176.948 transactions by directors and officers the mean (median) market capitalization of the sample firms is 5,419.9 Mio USD (763.1 Mio USD).

Asymmetric information theory suggests that the uncertainty about future prospects of smaller firms is higher than of large, well known firms. Therefore, insiders in small companies possess more valuable positive private information and have more incentives to profit from their superior information. We can confirm this in our data sample. Man-

agers tend to buy shares in firms with low market value. The mean (median) market value of companies with buy transactions is 2,579.1 million USD (251.7 million USD).

On the other hand, directors and officers tend to sell firms with high market value. The mean (median) market value of firms with insider sale transactions is 5,967.1 million USD (902.3 million USD) (see Table 1). This is comparable to the results documented in Fahlenbrach and Stulz (2009), who document that directors and officers decrease their ownership when their firms are performing well.

5.2 Short-run abnormal returns

The analysis of the short-run effects of insider filings starts on the day after the filing. The mean (median) buy-and-hold abnormal return (BHAR) for buy transactions of directors and officers amounts to 1.97% (1.15%) after 20 trading days. Both mean and median BHAR are statistical significant (see Table 2).

*** Insert table 2 about here ***

The calendar-time approach confirms these finding. For the first 20 trading days we document a significant daily α-value of 0.24% (see Panel A of Table 3). Therefore, the short-term results for insider buy transactions are consistent with hypothesis 1a. On the other hand, insider sale transactions do not precede negative abnormal returns. We can not report any abnormal buy-and-hold return with statistical significance for the first 20 trading days after the filing of an insider sale transaction (see Table 2). In addition, the calendar-time approach yields a positive daily alpha of 0.17% (see Panel B of Table 3).

*** Insert Table 3 about here ***

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5.3 Long-run returns

For insider buy transactions the calendar-time approach produces a significant daily alpha of 0.19% for the three year period (see Panel A of Table 3). In Panel B of Table 3 we document a daily alpha of 0.17% for insider sale transactions. For both the buy and the sale portfolio, the alpha-values have higher significance than the factor loadings.

Figure 2 exhibits the buy-and-hold returns (BHRs) following insider buy and insider sale transactions. Both tend to increase over time during the two years after the filing. In the third year after the filing, the increase of BHRs stops, followed by a slight decrease till the third anniversary after the filing.

*** Insert Figure 2 about here ***

The calendar-time approach has the disadvantage that the returns of companies with insider transactions are compared to the returns of portfolios containing firms with buy, sale, and no insider transactions. This fact might influence our results. We therefore also compare companies with insider transactions to companies with no insider transactions via the control firm approach outlined in Section 4.2.

For insider buy transactions we document a buy-and-hold abnormal return (BHAR) of 16.21% after three years (see Table 2). Our results suggest that insider buy transactions contain a long-run information value, which last (al least) up to three years. From the filing to the end of the first year our results in Table 2 reveal mean BHARs of 9.39%. From the end of the first year to the end of the second year we document an increase in average BHARs of 5.94%. From the end of the second year to the end of the third year the increase is only 0.88%, but is still positive. Overall, both, the results from the calendar-time and from the buy and hold abnormal return approach are in line with hypothesis 1b.

For insider sale transactions Table 2 shows a significant positive mean BHAR of 1.64% after the first year, of 4.49% after the second year and of 6.67% after the third year.

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Hence, our results reveal that insider sale transactions do not lead to statistically significant negative abnormal returns, neither in the short-run, nor in the long-run. Figure 3 exhibits the development of BHARs for the three years after insider buy as well as insider sale trades.

*** Insert Figure 3 about here ***

Insider sell transactions account for 91.01% of the shares traded and 96.32% of the dollar volume of all insider transactions in our sample. We take insider sale transactions as a proxy for equity-based compensation and managerial ownership. The long-run BHARs after insider sale transactions suggest that companies with managerial ownership and equity-based compensation perform better than comparable control firms without managerial ownership or no equity-based compensation scheme.

6. Conclusion

We analyze the performance of 4,368 U.S. firms traded on NYSE/NASDAQ/AMEX after insider buy and insider sale transactions. Our dataset consists of 28,578 buy transactions and of 148,370 sell transactions by directors and officers. The sample period starts in August 2003 and ends in October 2006, and, therefore, takes into account the changes in insider legislation imposed by the Sarbanes-Oxley act. To assess the firm performance we use a calendar-time approach and buy-and-hold abnormal returns based on a matching firm procedure.

Our results reveal that insider buy transactions reveal positive private information. But market participants fail to fully incorporate this information fully into stock prices and abnormal returns continue to increase up to three years after the insider trade.

Different to wide-spread expectations, insider sales do not contain negative private information. The high percentage of sale transactions relative to the total number of insider trades suggests that insider sales are caused by liquidity needs and the desire for

diversification. This indicates that insider sale transactions are a proxy for equity-based compensation. Our buy-and-hold abnormal return (BHAR) approach compares companies with insider transactions to those with no insider transactions. The corresponding results reveal that companies with insider sales earn significant BHARs in the long run, suggesting that firms with equity-based compensation outperform firms without equity-based compensation. Managers of good performing firms are (often) granted an equity-based bonus. Such ('good') firms also seem to perform above average after equity-based compensations have been granted.

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Table 1: Descriptive statistics

Table 1 presents descriptive statistics of insider transactions and firm characteristics for the final sample of insider trades. The final sample contains buy and sell transactions executed by directors and officers between August 2003 and October 2006.

	Total Sample	Buy Transactions	Sale Transactions
Number of trades	176,948	28,578	148,370
Total volume (USD)	150,869,359,310	5,556,791,621	145,312,567,689
	(100.00%)	(3.68%)	(96.32%)
Mean		194,442.99	979,393.19
Median		16,680	179,186.5
Total number of shares	5,254,740,356	472,290,135	4,782,450,221
	(100.00%)	(8.99%)	(91.01%)
Mean		16,526.35	32,233.27
Median		1,000	7,500
Number of companies	4,368	3,254	3,865
Average insider trades per company during the sample period	40.51	8.78	38.39
Average insider trades per company and per month	1.04	0.23	0.98
Market Capitalization (USD)			
Mean		2,579,131,256	5,967,058,819
Median		251,700,000	902,325,000

Table 2: Buy-and-Hold Abnormal Return

Table 2 exhibits 3-year buy-and-hold abnormal returns (BHARs) for insider purchase and insider sale transactions. Skewness-adjusted test-statistics are stated in brackets (.), bootstrapped p-values within [.]. We test the significance of the median BHAR using a Wilcoxon signed rank test with p-values within [.].

	Insider Buy Transactions		Insider Sell Transactions	
	Mean (%)	**Median (%)**	**Mean (%)**	**Median (%)**
20 days	1.97	1.15	-0.08	-0.07
	(22.48)	[0.000]	(2.40)	[0.005]
	[0.000]		[0.212]	
60 days	3.97	2.77	0.31	0.17
	(27.60)	[0.000]	(4.84)	[0.012]
	[0.000]		[0.027]	
125 days	6.23	4.12	1.00	0.72
	(26.46)	[0.000]	(10.56)	[0.000]
	[0.000]		[0.000]	
1 year	9.39	7.57	1.64	1.36
	(26.71)	[0.000]	(11.52)	[0.000]
	[0.000]		[0.000]	
2 years	15.33	11.84	4.49	5.18
	(28.54)	[0.000]	(21.01)	[0.000]
	[0.000]		[0.000]	
3 years	16.21	13.40	6.67	7.55
	(21.63)	[0.000]	(24.29)	[0.000]
	[0.000]		[0.000]	

Table 3: Calendar Time Approach

We construct a portfolio for inside buy transactions and a portfolio for insider sale transactions. Companies enter a portfolio on the day after the filing of the insider transaction. Portfolio returns are then regressed on the following four-factor model:

$$R_{b,t} - R_{f,t} = \alpha + \beta_1 \cdot (R_{M,t} - R_{f,t}) + \beta_2 \cdot SMB_t + \beta_3 \cdot HML_t + \beta_4 \cdot UMD_t + \varepsilon_t$$

With:
$R_{b,t}$: Return of the buy portfolio on day t
$R_{f,t}$: Riskless return on day t
$R_{M,t}$: Market return on day t
SMB_t: Size factor (small minus big)
HML_t: Book-to-market factor (high minus low)
UMD_t: Momentum factor

Panel A: Insider buy portfolios

Period	α	β_1	β_2	β_3	β_4
20 days	0.24	-0.04	0.12	0.16	-0.20
	(6.43)	(0.90)	(1.84)	(2.05)	(2.90)
	[0.000]	[0.368]	[0.067]	[0.041]	[0.004]
3 years	0.19	-0.03	0.13	0.19	-0.24
	(4.67)	(0.66)	(2.02)	(2.27)	(3.18)
	[0.000]	[0.508]	[0.043]	[0.023]	[0.002]

Panel B: Insider sale portfolios

Period	α	β_1	β_2	β_3	β_4
20 days	0.17	-0.06	0.21	0.25	-0.30
	(3.40)	(1.16)	(2.70)	(2.37)	(3.28)
	[0.001]	[0.246]	[0.007]	[0.018]	[0.001]
3 years	0.17	-0.05	0.18	0.24	-0.28
	(3.82)	(0.99)	(2.51)	(2.48)	(3.25)
	[0.000]	[0.324]	[0.012]	[0.013]	[0.001]

Figure 1:

Distribution of insider filings in relation to the transaction date

Figure 1 displays the number and cumulative frequency of insider filings after the transaction date. More than 90% of the insider transactions are filed within the first five trading days.
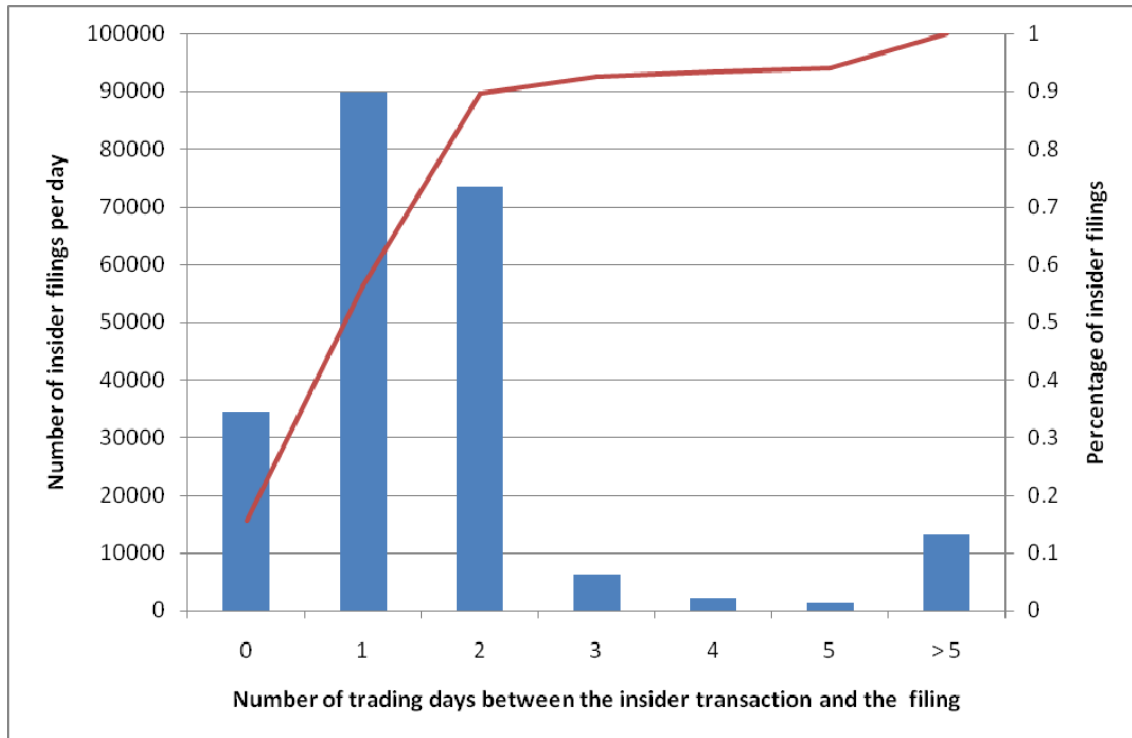
Figure 2: Buy-and-Hold Returns

Figure 2 shows buy-and-hold returns (BHRs) till the third anniversary after the corresponding filing for insider buy as well as insider sale transactions.
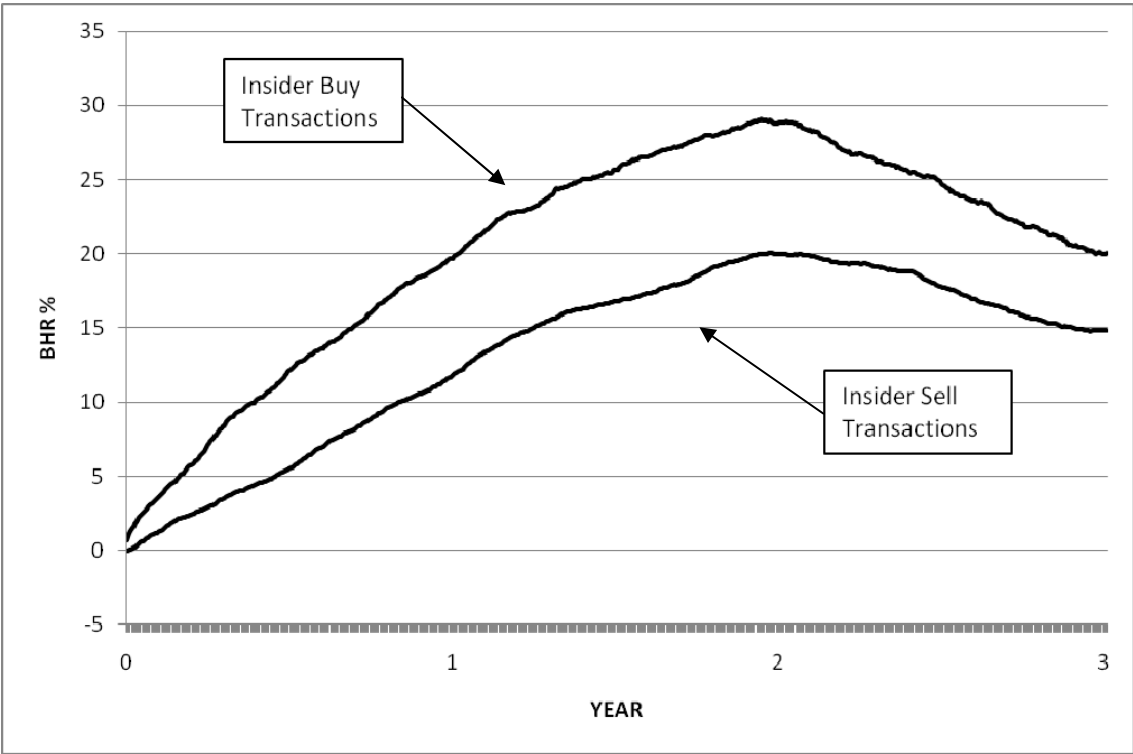
Figure 3: Buy-and-Hold Abnormal Returns

Figure 3 exhibits the 3-year buy-and-hold abnormal return (BHAR) after insider buy and insider sale transactions. BHARs are calculated using a control firm approach.