Impacts of Insider Trading

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Impacts of Insider Trading

Certificate of Originality

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Abstract of thesis entitled :

Impacts of Insider Trading

submitted by Leung Tak Yan

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This dissertation examines the impacts of the insider trading phenomenon in Hong Kong. Traditionally, insider trading activity has been viewed as a proof of market efficiency in a strong form level. Evidence from the various markets all over the world has demonstrated that insider trading (legally and illegally) can bring in abnormal profits for the traders. Earlier insider trading literature examines the timing of insider trading activity and the magnitude of the abnormal returns to corporate events such as mergers and acquisitions, rights issues and earnings announcements. More recent papers focus on the effects of insider trading activity on overall market returns and market microstructure issues such as liquidity.

Insider trading has been widely explored in the US, the UK and Canadian markets where there is a long history of regulated insider trading activity. While most of the literature evaluates insider trading behavior in the US and Europe, empirical evidence in this area concerning the other markets is limited. The recent implementation of regulations allowing and governing insider trading activity in other markets provides opportunities for research studies on insider trading under different market settings such as Norway, Australia, Spain, Singapore and Hong Kong. This dissertation attempts to provide an overall picture of the insider trading activity and its effects to firms and the market in Hong Kong.

The Hong Kong market is chosen for examination because the market setting, legal environment and corporate structure in Hong Kong are different from those of the more developed markets such as the US and the continental Europe:

1. Hong Kong is an emerging market. The degree and speed of inside information dissemination may be different from those in developed markets.
2. The disclosure requirement between Hong Kong and the US are different.
3. The directors in Hong Kong are frequent and heavy traders.
4. The corporate structure in Hong Kong is different from that of the US as many listed firms in Hong Kong are controlled by families.

There are four independent but related essays in this thesis which evaluates the directors' dealings in four different aspects, namely, (1) the magnitude and determinants of insider trading activity; (2) the effects of aggregate insider trading activity on market movement; (3) the liquidity effects of insider trading; and (4) the insider trading activity around corporate share repurchases.

The logic of the essay sequence is as follows:

First some overall statistics to identify relevant determinants of insider trading activity in Hong Kong are provided. Then the effects of insider trading activity on the whole market are evaluated. Afterwards, the dissertation takes a micro-perspective view by looking at its effects on liquidity at the firm levels. Finally, a corporate event (share repurchase) is selected and its relation to insider trading and their transaction effects are examined. This design attempts to provide a comprehensive picture about the impacts of insider trading from various angles.

Summary of the four essays are as follows:

Essay One : Insiders' Dealings in an Informationally Asymmetric Environment

The information asymmetry hypothesis argues that insiders are motivated by signaling function, insider profits or liquidity preference to trade in the market. Therefore, Essay 1 addresses the signaling impact of directors' dealing in an informationally asymmetric environment like Hong Kong. Both the short-term and long-term abnormal share price reactions of the insider trading firms are examined. Furthermore, the relations between insider trading activity and various information asymmetry proxies are examined.

The results are :

1. There are small but statistically significant short-term abnormal returns over a period of 60 trading days.
2. Sale is a more effective signal to predict future decrease in share price.
3. Higher insider trading profits are related to higher proportion of informed trading to total trading volume, smaller size firm, lower directors' share ownership and higher trading frequency.
4. The likelihood of insider trading is higher if there are higher proportion of intangible assets, better earnings performance, smaller sales value and higher variation in trading volume.

Essay Two : Do Insiders Have "Inside Information" on Aggregate Market Returns ?

The insider trading literature documents that informed trading of a given firm can predict firm-specific future share price movement for the firm concerned. However, if the general market movement is a reflection of the share price changes of all firms in the market, it is possible that insider trading, in aggregate, can predict future market

return. Therefore, Essay 2 assesses the aggregate signaling impact of insider trading on the future market movement as a whole to see if insider trading can facilitate the pricing efficiency of both the firms and the market comprehensively.

The results are :

1. The vector autoregressive (VAR) analysis shows that aggregate insider trading activity Granger-causes market return.
2. The informativeness of the aggregate insider trading activity to predict subsequent market return depends on the time horizon under examination. The shorter the time horizon, the stronger the predictive power of the insider trading activity is.
3. Lagged insider sales possess relatively more information content than lagged insider purchases.

Essay Three : Do Insiders Provide Liquidity ?

As insiders are in possession of confidential information, most insider trading studies focus on the profit-making motive of insiders. However, the information asymmetry model of market microstructure suggests that the presence of informed trading in the market would change the liquidity behaviour of the market. Therefore, one of the issues in the liquidity and insider trading literature is whether insider trading would enhance or impair market liquidity. Essay 3 explores the resultant impact of directors' dealing on the liquidity pattern of the firms.

The results are :

1. There are lower spread and higher depth on insider trading days than on non-insider trading days, suggesting that insider trading activity improves market liquidity.

2. The change in liquidity behaviour is affected by how heavily the shares are traded by the informed directors. Higher relative spread and lower depth are found as the proportion of informed trading increases.
3. The adverse selection cost analysis shows that the presence of directors' dealings enhances market liquidity by reducing the adverse information cost.

Essay Four : Double Signals or Single Signal ? An Investigation of Insider Trading Around Share Repurchase

According to the information asymmetry hypothesis, insiders have private information about the current mispricing and future prospects of the firms. Therefore, it is not surprising that the insiders would trade before a financial event. In the insider trading literature, many studies have been conducted to investigate the relation between insider trading activity and corporate announcements. Since both share repurchase and directors' dealing can be motivated by the information signaling purpose, Essay 4 examines the simultaneous signaling impacts of share repurchase and directors' dealing to evaluate the relative pricing effects and credibility of the undervaluation message.

The results are :

1. The directors' purchase activity around the share repurchasing period is significantly lower than the expected level while the directors' sale activity is abnormally higher than the expected level.
2. The "Repurchase Only" subsample earns higher abnormal returns than the "Repurchase and Buy" subsample which earns higher returns than the "Repurchase and Sell" subsample.

3. The Tobit model provides no evidence that information signaling is a dominant factor driving share repurchase decision.

In short, most of the results from the four essays are consistent with the views of the literature and some of the results are peculiar due to the different market setting, legal environment and corporate structure in Hong Kong.

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Essay 1

Insiders' Dealings in an Informationally Asymmetric Environment

Abstract

This study investigates the directors' dealing phenomenon in Hong Kong. The directors are frequent and heavy traders in the market. They often convey inconsistent trading signals and / or reverse their trades. The directors are able to accumulate small profits from their inside trades. An intensive and consistent insider trading strategy earns a higher profit than a conflicting trading one. Director sales are more effective in signaling a share price decrease than director purchases in signaling share price increases. A regression model shows that informed trading volume, firm size, and ownership percentage are significant determinants of the magnitude of insider profits. This study also provides evidence to support the hypothesis that insider trading is more likely if there is greater information asymmetry, i.e., when there is a higher proportion of intangible assets and smaller sales volume.

Essay 1

Insiders' Dealings in an Informationally Asymmetric Environment

I. Introduction

The insider trading phenomenon has been widely explored in the US, the UK and Canada. A large majority of these studies have been conducted to examine the profitability of insider trading. Studies in the US often document significant and high positive abnormal returns (Rozeff and Zaman 1988; Lin and Howe 1990; Jeng, Metrick and Zeckhauser 1999). Although there are also studies (Eckbo and Smith 1998; Lakonishok and Lee 2001) reporting smaller abnormal returns to insiders, possibly due to the imposition of strict regulations and heavy penalties on illegal insider trading practice, there is still a public perception that insiders abuse their privileged position (Seyhun 1998). This may be the reason why an increasing number of countries are imposing insider trading laws (Bhattacharya and Daouk 2002).

Insider trading continues to be a focus of finance research as there are unresolved controversies that have implications for the efficient market theory and regulatory policy. Informed trading by directors affects the informational efficiency of the market as the price will incorporate the insiders' information. Although the release of private information may help promote price adjustment that improves market efficiency, the efficiency is at the expense of a fair distribution of trading profits among different market participants in the economy. Insider trading attracts much public attention and there continues to be calls for further insider trading regulation to redress the perceived inequalities between insiders and outsiders. Policy-makers, academics and outsiders have long-standing concerns about the legality of inside transactions, profitability of insider trading, and fairness of trading practices.

This study explores directors' dealing activity in Hong Kong. Most of the studies on insider trading have been conducted using the data from the mature and developed markets (e.g., the US, the UK and Canada). Similar research in this area is limited in other markets. Hong Kong is an emerging market. The degree and speed of inside information dissemination may be different from those in the developed markets.

The rules governing insider trading in the US and Hong Kong are different. In Hong Kong, directors' dealings are mainly governed by Chapter 395 (Securities (Insider Dealing) Ordinance) and Chapter 396 (Securities (Disclosure of Interests) Ordinance) of the Laws of Hong Kong. The disclosure requirement in Hong Kong is more timely. In the US, the trade disclosure rule provides that the insiders have to report their share transactions to the Securities and Exchange Commission (SEC) within 10 days after the end of the month in which the transaction occurs. However, the disclosure rule in Hong Kong requires the trading directors to report their inside transactions to the Hong Kong Exchange within five trading days. In the US, there is an additional rule (section 16(b) of the Securities and Exchange Act of 1934) prohibiting the insiders from making round-trip trade profits (buy and then sell, or vice versa) within six months. The directors of the firms in Hong Kong are allowed to trade in the market if they comply with the disclosure requirement and do not trade with price-sensitive information before special announcements. The directors in Hong Kong are frequent and heavy traders. The trading record shows that 29.31% of transactions are day-to-day trading (Table 1). Directors often reverse the trading direction (buy and sell within a short period of time).

In addition to these Ordinances (Chapters 395 and 396), the Hong Kong Exchange also imposes a number of codes of conduct for the directors to comply with.

Appendix 10 (Model Code for Securities Transactions by Directors of Listed Companies) and Appendix 14 (Code of Best Practice) of the Listing Rules require the directors that they should not deal in any of the securities of their firms at any time when they are in possession of price-sensitive information[1].

A major characteristic of many Hong Kong listed corporations is that they are controlled by families. Although the statistics reported refer to the firms in their sample only, Claessens, Djankov and Lang (2000) show that, as at 1996, 26.2% of the total value of listed corporate assets in Hong Kong is under the control of five families. While the directors of these firms trade in their shares, the motivations for doing so may differ from insider dealing in the US. The differences in the stock market environment, legal environment and corporate structure between the US and Hong Kong may affect the directors' behaviour across the two markets. Therefore, the results from the US studies may not be automatically imputed to Hong Kong. The findings of this study using Hong Kong data on directors' dealings contributes to the knowledge of insider trading under different jurisdictions.

This study examines both the short-term and long-term stock returns of firms with directors' dealings. The presence of short-term profits shows that the directors have used their private information to conduct profitable trades in the market. The results for long-term performance indicate that insider trading provides a signaling effect for the future share price movement of the firms. The factors that differentiate firms with higher incidences of insider trading are examined. The study evaluates the

[1] Rule A.3 of Appendix 10 (Model Code for Securities Transactions by Directors of Listed Companies) of the Listing Rules states that the directors must not deal in any securities of their firms during the period commencing one month immediately preceding the earlier of the date of the board meeting for the approval of the financial results for any year, half-year, quarterly or any other interim period and the announcement deadline of the results for any year or half-year or quarterly or any other interim period. An article by David Webb mentions that there always exists a time gap between the knowledge of private information and the timing of such information being released to the public, particularly before the earnings announcement. The directors are more likely to conduct more trades if the time gap is longer.

likelihood of insider trading by examining the information asymmetry environment of the trading firms. While many previous studies (for example, Seyhun 1986; Lakonishok and Lee 2001) place an emphasis on the informativeness (profitability) of insider trading, an analysis of the information asymmetry environment of the insider trading firms provides additional insight on insiders' motivations.

A control firm approach is used to measure the share price performance of the firms. The results show that directors are able to reap small but statistically significant abnormal returns over a period of 60 trading days. The presence of short-term returns provides evidence that insider trading is profitable. A director sale is a more effective signal to indicate future share price change (in fact, a decrease). The likelihood of insider trading is affected by the extent of information asymmetry between insiders and outsiders, which are reflected in the accounting numbers disclosed by the firms.

This essay proceeds as follows. Section II presents the literature review. Data and methodology are described in Section III. Section IV reports the results and Section V concludes the study.

II. Literature Review

The "information model" theory hypothesizes that insider trading should be profitable. The most usual type of tests on insider trading examines the impact of inside transactions on the share price movement of the firms concerned and the profits generated by the insiders. In the early studies on the US market, significant abnormal returns are found (Jaffe 1974; Finnerty 1976; Seyhun 1986). The more recent study of Lakonishok and Lee (2001) reports a smaller market reaction around the time when

the insiders trade in the market. The lower level of abnormal returns reported in the recent studies is argued to be the result of imposition of stricter insider trading rules.

Other studies in the UK (Pope, Morris and Peel 1990; Gregory, Matatko, Tonks and Purkis 1994; Gregory, Matatko and Tonks 1997) and Canada (Lee and Bishara 1989) report similar results of profitability for insiders although to varying degrees. Eckbo and Smith (1998) conduct an insider trading analysis of firms listed on the Oslo Stock Exchange and find zero (or negative) returns for the insider portfolio. However, Eckbo and Smith conclude that the performance of the insiders is conditional on the evaluation approach.

Wong, Cheung and Wu (2000) examine the abnormal returns associated with insider trading from September 1991 to June 1993 in the Hong Kong stock market. Prices increase (decrease) following insider purchases (sales). Their results show that insider trading activity is more profitable for small firms and trading volume is a factor determining the magnitude of abnormal returns.

As insider trading is motivated by the informational difference between the insiders and outsiders, a new strand of research (Aboody and Lev 2000; Huddart and Ke 2001; Frankel and Li 2001) has examined the impact of information asymmetry on the likelihood of insider trading. Insider trading is expected to be more likely in an informationally asymmetric environment. Examples of information asymmetry proxies include the number of financial analysts following the firms (Brennan and Subrahmanyam 1995; Alford and Berger 1999; Huddart and Ke 2001), stock return volatility (Krishnaswami and Subramaniam 1999), value of research and development expenditure (Aboody and Lev 2000) and firm size (Lakonishok and Lee 2001). This study uses published financial statement data to evaluate the likelihood of directors' dealings in Hong Kong. The unique characteristics of less stringent insider trading

regulation, high dealing frequency of directors and substantial share-holdings in listed firms by family-members in Hong Kong provide an informationally asymmetric environment for such kind of analysis.

III. Data and Methodology

Data

The source of data for the study is the Inside Trade Asia database marketed by Primark[2]. The analysis in this study covers a 7-year period from 1993 to 1999. The sample includes those inside transactions which increase and decrease the share-holdings of the insiders through the open market purchase and sale of the shares. The changes in the share-holding of the insiders which are the result of exercising options, warrants, bonus warrants and rights, the issue of bonus shares, the conversion of bonds and debentures, special and scrip dividends, stock splits as well as gifts are excluded[3]. Transactions with data inconsistency (such as missing and mismatching data) are also eliminated.

After the records are checked for mismatching data, the transaction records for firm i trading on day t are aggregated[4] (if the trades for firm i on day t are of the same transaction direction) or netted (if the trades for firm i on day t are of opposite transaction directions). The sample excludes those transaction records where the net number of shares traded on any event day t of firm i is zero. If the transaction date

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[2] The database covers the share transactions of directors from 1993 onwards. The source of data for the database is the Securities (Disclosure of Interest) (SDI) Daily Summary and Directors' / Chief Executives' Notification Report issued by the Hong Kong Exchange. The directors are required by the Laws of Hong Kong (Chapter 396) to disclose their dealings in the securities market within five days to the Hong Kong Exchange from the day their duty to disclose arises. The transaction information is then recorded on the SDI Summary Report.

[3] Since it is expected that open market purchase and sale of shares by insiders are more likely to be motivated by the use of special inside information, the other transaction types are excluded. This exclusion of other transaction types is also consistent with most of the US studies (e.g. Lin and Howe 1990) on insider trading.

falls on Saturday, Sunday and public holidays, the actual transaction date is amended to the first trading day following the weekends or public holidays.

The trading characteristics of the transaction records for the sample are reported in Table 1. This study examines the insider trading activity in terms of three measures, the number of shares, the market value, and the number of transactions. As shown in Panel A of Table 1, the sample includes insider trading activity of 580 firms. Over the seven years between 1993 and 1999, the directors traded 74,271 millions of shares with a market value of HK$ 165,293 million in 33,675 transactions. The average daily proportion of informed trading volume to total trading volume is 35.52% (40.74% for purchases and 25.19% for sales).

Panel B of Table 1 exhibits the distribution of the length of time between two consecutive trades in terms of the number of trading days. The statistics show that the trades by the directors are very frequent. It is very common for the directors to conduct trades on consecutive days. Almost 30% of the total records are day-to-day trades which occupy the largest proportion of the total records. Approximately 61% and 79% of the trades are made within 5 days and 20 days respectively of a previous trade.

It has been argued that mixed or conflicting transactions will be less informative than those transactions with the same trading direction. As the mixed transactions carry inconsistent information signals to the market, there will be conflicting effects on the share price movement of the firm. Therefore, the abnormal returns that accrue to a particular event day t with conflicting transactions should be lower than those that accrue to the event day t which consists of purchase or sale only.

[4] Seyhun (1988; 1992) suggests that aggregate insider trading has more information content to predict future market return.

Furthermore, in order to isolate the effect of trade reversals on the market reactions, the overall sample is divided into three more subsamples : "Sole Purchase", "Sole Sale", and "Mixed Transactions", in addition to the usual "Buy" and "Sell" subsamples. If there are only purchase or sale transactions for the share of any firm i for 60 trading days, the transaction on that event day t is labeled as purchase only or sale only and classified into the "Sole Purchase" subsample or "Sole Sale" subsample respectively. If for any firm i, there are both purchases and sales on any particular event day t and over the event window of 60 trading days, the whole series of transactions for that firm i are classified into the "Mixed Transactions" subsample[5].

When the overall sample is divided into "Sole Purchase", "Sole Sale", and "Mixed Transactions" subsamples, there are 3,635, 1,289 and 4,461 transaction records respectively. The largest proportion (47.53%) of the overall sample of 9,385 records are classified as "Mixed Transactions", and this suggests that it is common for the directors of the same firm to signal inconsistent trading information and / or to reverse their trade direction even within a short time period of 60 trading days[6].

Methodology

Event Study

In order to estimate the magnitude of the share price reactions of the firms with insider dealings, the event methodology is employed. The event date (t = 0)

[5] This classification of subsamples is similar to that of Lee (1997). Lee divides his sample into pure insider purchasing (selling) firms if the firms only purchase (sell) shares during the 6-month period before and at the announcement date of seasoned equity offerings. The other firms are termed mixed trading firms.

[6] Besides using a window of 60 days to classify the "Sole Purchase", "Sole Sale" and "Mixed Transactions" subsamples, this study also uses a shorter window of 30 days. When a 30-day window is used, "Sole Purchase" subsample size increases from 3,635 to 4,510 (38.73% to 48.06%); "Sole Sale" subsample size increases from 1,289 to 1,671 (13.73% to 17.81%); and "Mixed Transactions" subsample size decreases from 4,461 to 3,204 (47.53% to 34.14%).

taken is the transaction date[7] when there is an insider dealing in the securities market. These transactions increase or decrease the shareholding through the purchase or sale of shares as reported on the Securities (Disclosure of Interest) Summary. The control firm approach[8] is used to compute the abnormal returns of the sample firms. The abnormal return (AR_{it}) for sample firm i on day t is defined as :

$$AR_{it} = (SR_{it} - CR_{it}) \times \theta \quad (1)$$

SR_{it} and CR_{it} are the actual returns of sample firm i and control firm i on day t respectively. θ is a variable for the direction of trade which takes the value of +1 if the trade j is a "Buy" transaction and –1 if the trade j is a "Sell" transaction[9].

The whole sample consists of both "Buy" and "Sell" transactions. There are 6,421 (68.42%) purchase and 2,964 (31.58%) sale transaction records, making up a total of 9,385 transaction records in the sample. The abnormal returns for the insiders increase when the share prices rise after the "Purchase" and when the share prices fall after the "Sale". In order to aggregate the total abnormal returns for both the insiders' "Purchase" and "Sale", the abnormal returns of the "Sell" transactions are multiplied by –1.

There are two benchmarks, market value of equity and book-to-market ratio, for identifying a control firm. The market value[10] and book-to-market ratio[11] of all

[7] The transaction date rather than the announcement date is chosen as the event date. If the market is efficient, it should respond to the inside transaction on the transaction day. Lakonishok and Lee (2001) also find a larger abnormal return around the trading period (0.59%) rather than the reporting period (0.13%) in their study using US data. It appears that the market reacts around the trading period.

[8] Fama (1998) argues that the magnitude of abnormal returns is sensitive to the benchmark used for computation. To better measure the share price reaction (especially the long-term performance), this study adopts the control firm approach to adjust for the firm size and book-to-market ratio differences when measuring abnormal returns.

[9] It is easy to demarcate the trades of a given firm i on a particular day t into the "Buy" or "Sell" portfolio when there is absolute consensus among the directors in trading their firms' shares. When there is more than one transaction or there are conflicting transactions for a given firm i on a particular day t, firm i is classified into the "Buy" ("Sell") portfolio when the net number of shares traded increases (decreases) the aggregate share-holding balance of all the directors trading in their firms' shares on the day concerned.

[10] The market value of firm i in month m is calculated by multiplying the number of outstanding shares and the monthly average price.

industrial companies in the PACAP database in month m are ranked into 10 deciles. Each firm is assigned with a ranking from 1 to 10 according to the magnitude of the market value and book-to-market ratio. A sample firm is matched to a control firm if the control firm satisfies three conditions. There is no directors' dealing in the control firm during the test period. The control firm is in the same market value decile ranking and book-to-market ratio decile ranking as the sample firm. These selection criteria reduce the original sample of 19,333 observations to 9,385 observations for the event study.

Each firm's abnormal return on day t (AR_{it}) is aggregated and averaged to form the average abnormal return (AAR_t) of the sample portfolio on day t :

$$AAR_t = \frac{1}{N_t} \times \sum_{i=1}^{N_t} AR_{it} \qquad (2)$$

N_t is the number of observations on day t.

To measure the average abnormal return over a specific event time period, τ, the cumulative abnormal return, CAR_τ is computed as :

$$CAR_\tau = \sum_{t=1}^{\tau} AAR_t \qquad (3)$$

τ is the last day in the specific event period examined.

Following the method outlined by Brown and Warner (1985, page 7), the t-statistic for the abnormal return is the ratio of the abnormal return on day t to the estimated standard deviation computed in the estimation period. The estimation period covers a 240-day period from t = -250 to t = -11.

[11] The book-to-market ratio is the ratio of the book value of equity to the market value of equity. The book value of equity in month m is the average of the beginning value and ending value of equity in year y.

Regression Analysis

There are two regression models in the study. The first regression model evaluates the cross-sectional variation in the level of abnormal returns of insider trading firms. The second regression analysis tests the impact of the information asymmetry attributes on the frequency of insider trading activity.

It has been shown in many US studies (Seyhun 1986; Lin and Howe 1990) that the strength of the inside information possessed by the insiders can be reflected by the characteristics of the trading transactions. Since the magnitude of the insiders' abnormal returns is influenced by the quality of their inside information, there should be some relations between the amount of the insiders' profits and the different characteristics of the trading transactions. Potential relations are examined in the following cross-sectional regression model (firm and time subscripts are suppressed) :

$$CAR = \alpha_0 + \beta_1 PROP + \beta_2 SIGN + \beta_3 CONSENSUS + \beta_4 FSIZE + \beta_5 OWN + \beta_6 DATE \quad (4)$$

CAR is the abnormal return over different time periods ($-10 \le t \le -1$, $-1 \le t \le +1$, $-3 \le t \le +3$, $t = 0$, $+10 \le t \le +120$, $+10 \le t \le +240$ and $+10 \le t \le +360$). PROP is the ratio of the number of shares traded by the directors to the total trading volume of firm i on day t. SIGN is a dummy variable which takes the value of 1 if trade j is a "Buy" and 0 otherwise. CONSENSUS is the ratio of the difference between the total and net number of transactions[12] to the total number of transactions measured over the five trading days around the event day ($-2 \le t \le +2$)[13]. FSIZE represents firm size and is estimated as the natural log of the market value of the firm, which is the product of the price and the number of outstanding shares of firm i on day t. OWN is the proportion of the share-holding in trade j to the total number of outstanding shares of

[12] The difference between the total number and net number differentiates those observations which have absolute consensus with no conflicting trade from the other observations which have the same net number but with conflicting trades.

firm i on day t[14]. DATE is a variable for the time length (in terms of the number of trading days) between two consecutive trades and takes the value of 1 if the length of time between an insider trade and a subsequent trade is greater than 10 days, and 0 otherwise.

Some studies examine the relation between the likelihood or intensity of insider trading activity and information asymmetry of the firm (Aboody and Lev 2000; Huddart and Ke 2001; Frankel and Li 2001). The expected size of an insider trade is a function of the information environment and the insiders' informational advantage. There are two informational motive arguments for insider trades. The short-term profit-seeking hypothesis proposes that the insiders may trade to earn profits from their private information. The signaling hypothesis suggests that the insiders can signal high firm value by selling less stocks and buying more stocks than otherwise, if information asymmetry is large. Huddart and Ke (2001) relate insider trades with information asymmetry proxies and find insiders trade to signal firm value.

Huddart and Ke (2001) suggest that the variables that proxy the information asymmetry environment can be grouped into the nature of firm's assets, informativeness of accounting disclosure, external information search activities and firm-specific characteristics. The relations between insider trading activity and the various information asymmetry variables are examined in the following regression model (firm and time subscripts are suppressed) :

$$\text{Insider} = \alpha_0 + \beta_1 \text{ INTANGIBLE} + \beta_2 \text{ LossD} + \beta_3 \text{ LnSALE} + \beta_4 \text{ SDVOL} + \beta_5 \text{ FSIZE} + \beta_6 \text{ AvgRet} \quad (5)$$

[13] It is assumed that if the trade is motivated by information, the insiders would most probably trade on the few days around the time the information is known.

[14] If there is more than one insider trading in the shares of the firm concerned, the percentages of the ownership of all the trading insiders involved are aggregated.

Insider is the log measure of the insider trading activity for the year. The measures are in terms of the total value of the number of shares, market value, and number of transactions traded by the directors.

Huddart and Ke (2001) argue that information asymmetry is related to the nature of firm assets. INTANGIBLE is the ratio of the book value of intangibles to the total asset value of firm i. A greater proportion of intangible assets in the total assets provide greater flexibility in earnings, implying greater informational differences about the intrinsic value of the firm (Barth and Kasznik 1999). It is expected that the greater the proportion of intangible assets in the total assets, the higher the information asymmetry.

LossD is a dummy variable which takes the value of 1 if the net income is negative and 0 otherwise. Reported earnings is a measure for the quality of information disclosure and magnitude of underlying economic uncertainties (Elliott and Hanna 1996). This variable is used to test the information quality of the earnings figure and the prospects of future profitability. If a firm reports a loss for the year, there is an increased uncertainty about the financial viability of the firm in the coming years. Higher uncertainty about the future prospects of a firm implies a wider informational difference between insiders and outsiders about the true value of the firm (Huddart and Ke 2001).

LnSALE is the log value of total sales of firm i. LnSALE is an external information search variable (Huddart and Ke 2001). In accordance with the hypothesis of Huddart and Ke, an important force reducing information asymmetry is the collection of firm information by outsiders, principally, the analysts. Huddart and Ke suggest two proxies for the external information search variable, the number of active analysts and the natural logarithm of total sales, to capture information search

activities of outside investors. However, the number of active analysts following the firm is highly correlated with firm size. Since firm size is also included in the regression model, the impact of outside information collection should be captured by firm size. A high value of LnSALE is related to low information asymmetry with outside information collection.

Other firm characteristics used as proxies for information asymmetry in the model are trading volume (SDVOL), firm size (FSIZE) and average return (AvgRet). SDVOL is the ratio of standard deviation of monthly trading volume over the 36 months before the trading month to the number of outstanding shares in firm i. FSIZE is the log of the market value of firm i. AvgRet is the average return of firm i for 150 days before the trade (Lakonishok and Lee 2001).

IV. Empirical Results

Event Study

The event study results[15] for the six subsamples (Overall, Buy, Sell, Sole Purchase, Sole Sale and Mixed Transactions) from t = -10 to t = +360 are reported in Table 2[16]. The levels of abnormal returns of the time periods examined before ($-10 \leq t \leq -1$) are negative, suggesting that the share return is low (high) before the insider purchase (sale). Except for the "Buy" and "Sole Purchase" subsamples, the abnormal returns on day t = 0 of the "Overall", "Sell", "Sole Sale" and Mixed Transactions" subsamples are negative and significant. The negative abnormal returns around the transaction day ($-1 \leq t \leq +1$, $-3 \leq t \leq +3$, $t = 0$) show that the directors have timing ability to buy their shares at a low price and sell their shares at a high price. The

[15] Besides using the control firm approach to compute the abnormal return, for robustness purposes, the market return (proxied by the Hang Seng Index (HSI) is also used for the computation of abnormal returns. The results are qualitatively similar to those reported in Table 2.

directors are able to earn short-term profits. The abnormal return for 60 days is 1.18% (t = 2.68). This finding provides support for the hypothesis that insider trading is profitable.

When the securities trading information of directors are released, the outsiders may undertake a mimicking strategy to imitate the transaction patterns of the directors. Under this strategy, the outside investors copy the transaction patterns of the directors after the transaction day. The abnormal returns for 2-day ($+1 \leq t \leq +2$) and 3-day ($+1 \leq t \leq +3$) periods are 0.19% and 0.21% respectively. Although the positive returns show that the mimicking strategy is also money-making, the fairly small magnitude of abnormal returns indicates that the possibility for the outsiders to earn a substantial profit from the mimicking strategy is small. Since transaction costs are not considered in the study, the mimicking profit net of transaction cost would be even less. It appears that it is not cost-effective to be an imitator. When the sample is divided into "Buy" and "Sell" subsamples, the abnormal return results suggest that the outsiders should imitate the directors selectively. The higher returns for the "Sell" transactions (0.53% for 2-day return and 0.67% for 3-day return) imply that a more profitable mimicking strategy should be based on directors' sales rather than directors' purchases.

The long-term share price performance of the firm is measured in order to examine if there is a signaling function of insider trading. Comparing the abnormal returns of the "Buy" and "Sell" subsamples for 360 days, there is a significant abnormal loss of 6.2% for the "Buy" subsample and a significant abnormal gain of 16.91% for the "Sell" subsample. The abnormal returns for insider sale indicate that there is a share price decrease subsequent to the sales by directors. The directors can

[16] In order to minimize the impact of outliers, the top 1% and bottom 1% of abnormal return

avoid abnormal losses by selling before the share price decreases. In contrast, purchases by directors are not followed by a share price increase but a share price decrease. These results imply that an insider sale is a more effective signal to predict future share prices. The finding is not consistent with those documented in the US (Lakonishok and Lee 2001) and the UK (Gregory, Matatko and Tonks 1997) studies, which conclude that an insider purchase is more informative in generating abnormal returns. Chowdhury, Howe and Lin (1993) suggest that one reason for an insider sale to have less information content is due to the higher frequency of insider sales. The higher incidence of insider sales may be explained by a liquidity motivation. Table 1 reports that the frequency of director sales is not high. The average buy / sell ratios for the number of shares, market value, and number of transactions are 0.99, 1.25, and 2.19 respectively. The relatively smaller number of sale transactions, coupled with the abnormal return results, implies that director sales may not necessarily be motivated by liquidity reasons. The lower relative frequency of director sales in Hong Kong may add more credibility to the signaling function of a director sale[17].

In order to further evaluate the impact of "Buy" and "Sell" signals without the influence of conflicting signals, the sample is categorized into "Sole Purchase", "Sole Sale", and "Mixed Transactions" subsamples. If information quality is reflected in the trading direction consensus, it is expected this will lead to greater abnormal returns for the "Sole Purchase" and "Sole Sale" than for the "Mixed Transactions" subsamples. The results show that there are significant abnormal returns in the "Sole Sale" subsample. There are opposite return paths for the "Sole Purchase" and "Mixed

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observations are deleted from the sample.

[17] Table 1 Panel B shows that the time length between two consecutive trades is very short. In order to check whether the abnormal share price reaction would be sensitive to the frequency of repeated transactions, the total sample is divided into four additional subsample, "No Transactions 5 Days Prior", "No Transactions 10 Days Prior", "No Transactions 15 Days Prior" and "No Transactions 20 Days Prior". The results are reported in Appendix 1.

Transactions" subsamples. The "Mixed Transactions ("Sole Purchase")" subsample earns a positive abnormal return of 2.02% (negative abnormal return of 1.89%) for the 240-day period but has a negative return of 1.06% (positive return of 3.53%) for the 360-day period after the transaction day[18].

In late 1997, most stock markets in Asia experienced a severe financial crisis. In Hong Kong, the Hang Seng Index (HSI) started to drop rapidly from October 20, 1997, with the two largest down swings on October 23 (-10.99%) and October 28 (-14.73%). Many studies (e.g., Kaminsky and Schmukler 1999) examine the causes and impacts of Asian financial crisis on the trading behaviour of investors (outsiders). In order to evaluate if the structural changes in the financial market due to the Asian financial crisis had an effect on the investment behaviour of directors (insiders), the whole sample period between 1993 and 1999 is divided into two subsample periods, from 1993 to 1997 (7,207 observations) and from 1998 to 1999 (2,178 observations). The results are reported in Panels B and C of Table 2.

The findings shown in Panels B and C are qualitatively similar to those in Panel A. The results in Panel C show that the "Sole Sale" subsample earns negative abnormal returns. However, the conclusion that a directors' sale is more profitable still holds as "Sell" transactions outperform "Buy" transactions in all three sample periods. The more negative abnormal returns in 1998-1999 may be due to the long-term impact of Asian financial crisis on the Hong Kong stock market.

[18] This study also performs event study for the three subsamples using a window of 30 days (instead of 60 days) for subsample classification. The results are reported in Appendix 2. In general, the abnormal returns for the three subsamples using a shorter window of 30 days are lower. The long-term abnormal returns ($+10 \leq t \leq +360$) for "Sole Purchase", "Sole Sale" and "Mixed Transactions" subsamples are 2.14% (vs 3.53%), 7.38% (vs 7.48%) and -1.66% (vs -1.06%) respectively.

Regression Model 1 (equation (4))

Table 3 reports the regression results between the level of abnormal returns from t = -10 to t = +360 and the six variables (PROP, SIGN, CONSENSUS, FSIZE, OWN, and DATE). The summary statistics and regression results of the variables are shown in Panel A and Panel B, respectively.

Insiders transact a larger volume of shares when they have a higher level of confidential information (Seyhun 1986). Therefore, trade size should be positively associated with the value of inside information and hence the profitability of insider trading. The results show that the level of abnormal returns is a positive function of PROP in the short-term. This result is consistent with the hypothesis that a higher proportion of informed trading relative to uninformed trading over total trading volume leads to higher abnormal returns. Long-term returns are not significantly related to PROP.

SIGN is the trade sign of the transaction. SIGN is positively and negatively related to the level of abnormal returns in the short-term and long-term respectively. The results show that the director-sellers earn higher long-term abnormal profits. The finding is contrary to most US and UK studies (Seyhun 1986; Lin and Howe 1990; Gregory, Matatko and Tonks 1997; Lakonishok and Lee 2001), which show that a "Buy" signal generates higher abnormal returns and is driven by information rather than by liquidity reasons. This study finds that the "Sell" signal is more informative as it generates more pronounced share price reactions.

CONSENSUS is an indication of the quality of information possessed by the insiders. A small value for CONSENSUS means a high degree of consistency in trading direction. The coefficients on CONSENSUS are positive and significant in the days before and surrounding the inside trade. The positive relation suggests that

an inconsistent trading signal is profitable in the short-run. CONSENSUS is not significant for the long-term returns.

FSIZE is a measure to test if firm size has an impact on the insider trading phenomenon. Firm size is negatively related to abnormal returns in the during- and post-insider-trading periods, and is statistically significant for the 120 days and 240 days after the trade. The higher returns accruing to trading in smaller firms may be due to the fewer disclosures of information by small firms. Therefore, any single piece of insider trading data contains relatively more information.

Ownership percentage represents the financial stake of the directors in the firms. Since more profitable insider trading can be derived from the use of more inside information, the level of abnormal returns accruing to the insiders should be positively related to the percentage of the firms' shares held by the insiders. OWN is negatively associated with the level of abnormal return in most of the time periods examined (except in the $+10 \leq t \leq +240$ period). The negative relation between the ownership percentage and share price value gives support to the entrenchment hypothesis (Morck, Shleifer and Vishny 1988; McConnell and Servaes 1990; Kole 1995) which says that decreasing management share-holding can increase firm value. Note, however, that the coefficients are not statistically significant[19].

There are two implications for the share price reaction of frequent directors' dealings. The repeated inside transactions suggest that the directors have superior inside information to trade recurrently to turn the inside information into profits. Therefore, there should be a positive share price reaction to the series of inside transactions. However, the efficient market hypothesis argues that the share price reaction should be more pronounced for the first released inside transaction.

[19] The coefficient on day 0 is significant at the 0.10 level (and 0.05 level, one-tail).

Therefore, the share price movement of those transactions with numerous prior inside transactions should diminish as the market has already responded to the same type of information previously. DATE is mostly negatively associated with the level of abnormal returns. It is significant at the 0.05 level over the 7-day period and marginally significant at the 0.1 level over the 3-day period around the transaction day. The negative relation implies that repeated inside transactions in a short period of time is an indicator of information quality. Therefore, every incident of director's dealing in the market releases new information or reinforces "quality" information to the market. The level of abnormal returns increases with the trading frequency. This finding suggests that the market regards those transactions of the more frequently trading directors to be more informative than those of the less actively trading ones.

Regression Model 2 (equation (5))

While the first regression model examines the determinants of trading profitability, the second regression model analyzes the frequency of insider trading. The results of the second regression model (equation (5)) are shown in Table 4[20]. Panel A reports the summary statistics of the six information asymmetry proxies in the regression model. Panel B shows the results for equation (5). t-statistics of the results are adjusted for heteroskedasticity with White's (1980) procedure.

The multiple regression model tests the overall and relative predictive power of the set of independent variables on the frequency of insider trading activity. As all the independent variables tested in the second regression model are information asymmetry proxies, there is a concern that the independent variables may be closely

[20] In Table 4 Panel B, the dependent variables are log values of the total number of shares, the total market value and the total number of transactions. For robustness purposes, three alternative variables, informed trading volume in percentage of shares outstanding, informed trading value in percentage of

correlated with each other. The degree of multicollinearity of the independent variables is checked using variance inflation factors. The variance inflation factor values of the independent variables are between 1 and 1.4, suggesting that there is no multicollinearity problem in the regression model.

INTANGIBLE is positively and significantly related to the number of shares and market value[21]. The positive coefficients on INTANGIBLE show that the intensity of insider trading activity is higher if the proportion of intangible assets over total assets is higher. This result is consistent with the hypothesis that greater information asymmetry is related to insider trading activity.

According to the signaling hypothesis of Huddart and Ke (2001), a positive relation is expected between LossD and insider trading activity as a loss figure indicates higher information asymmetry. Table 4 shows that LossD[22] is negatively and significantly related to the market value measure of insider trading activity. The negative relation does not support the signaling hypothesis of Huddart and Ke where insiders trade more when information asymmetry is large (estimated as negative income). However, the negative relation is consistent with the short-term profit-seeking hypothesis that insiders trade more to earn profits from their private information of positive income.

A high (low) LnSALE value is expected to be related to low (high) information asymmetry. In Table 4, LnSALE is negatively related to the measures of

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firm market value and informed trading volume in percentage of daily volume, are used as proxies for the frequency of insider trading activity. The results are reported in Appendix 3.

[21] Huddart and Ke (2001) suggest more than one variable is needed to capture the impact of the nature of firm assets on insider trading; examples include research and development expenses over total sales, net property, plant and equipment over total assets and book intangible assets over total assets. For robustness purposes, this study also uses an alternative measure (the ratio of net fixed assets over total assets) in the regression model. Consistent with the hypothesis that greater information asymmetry is related to more insider trading activity, the ratio of net fixed assets over total assets is negatively related to insider trading activity.

insider trading activity. The significant and negative relation suggests that insiders trade more when information asymmetry is large.

Kyle (1985) suggests that insiders' trading strategy is affected by the variance of the net amount of stock demanded by liquidity traders in a given period. The price adjustment by the market is smaller if the variability of uninformed order imbalance increases. High information asymmetry about the firm may deter market participants from trading. In contrast to the hypothesis that low variability of trading volume implies high information asymmetry, the coefficients on SDVOL are significantly positive[23]. The positive relation suggests that the insiders trade more when there is a high variation in trading volume and heavy trading days. A possible explanation for insider trading on heavy trading days is that the insiders may attempt to disguise their informed trades.

The information content of insider trades should be greater for smaller firms than for larger firms (Seyhun 1986; Lakonishok and Lee 2001). It is expected that the information asymmetry should be higher for smaller firms. However, Table 4 reports that FSIZE is positively and significantly related to the market value of insider trades. The positive coefficients indicate that insiders of large firms trade more than the insiders of smaller firms do. Dittmar (2000) argues that large firms may also be misvalued. In addition, since large firms and the directors of large firms have more shares, there should be more insider trades. Therefore, the insiders of both large and small firms may use insider trading activity to signal the true value of their firms.

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[22] Huddart and Ke (2001) suggest the proportion of extraordinary gains and losses to total sales as an alternative measure of informativeness of financial disclosure. However, data on extraordinary gains and losses are too few for analysis.

[23] For robustness purposes, besides using SDVOL (the ratio of standard deviation of monthly trading volume over 36 months before the trading month to the number of outstanding shares), this study also uses an alternative measure, which is the trading volume as a percentage of the number of outstanding shares. The results are qualitatively the same.

Lakonishok and Lee (2001) show that stock momentum is related to insider trading. According to the signaling hypothesis of Huddart and Ke (2001), the coefficient on Retavg is expected to be negative as insider trading activity should be stronger during share price decreases. In Table 4, there is a positive and significant relation between Retavg and the market value of insider trades. This result is consistent with the profit-seeking hypothesis that insiders trade more during share price increases rather than decreases.

While Huddart and Ke (2001) provide evidence that is mainly consistent with the signaling role for insider trades, this study finds that insiders may trade for profit-seeking and signaling purposes. The insiders trade more to signal firm value when the information asymmetry is large, i.e., there is a higher proportion of intangible assets and sales value is small. The insiders may also trade to earn profits from their informational advantage, i.e., there is good earnings performance and increasing share price.

V. Conclusion

This study examines the impact of directors' dealings on the share price movement of the firms listed on the Hong Kong Exchange. The analysis covers a 7-year period from 1993 to 1999 using 9,385 records of directors' dealings. One characteristic of directors' dealings is that they trade frequently and often reverse their trades (buy, sell, buy, sell, etc.) in a short period of time.

The event study identifies small positive cumulative abnormal returns for insider trading activity. The small magnitude of returns found in this study is inconsistent with those shown in the earlier studies (e.g. Jaffe 1974; Finnerty 1976). However, the finding is similar to the results of the more recent studies by Eckbo and

Smith (1998) and Lakonishok and Lee (2001), who report only small positive or zero abnormal returns around the time directors trade in the market. Although the magnitude of returns is small, the results give support to the signaling hypothesis that the directors have inside information to time the coming share price movement to trade in the market for profit.

The trading frequency and volume of insider purchases are higher than those of insider sales. The "Buy" transactions are less profitable than the "Sell" transactions. This finding is contradictory to the usual results found in the UK and US studies (Gregory, Matatko and Tonks 1997; Lakonishok and Lee 2001). The reasons for more number of net buyers than net sellers of their firms' shares may be due to the concentrated ownership structure in Hong Kong. It is a popular practice for the directors to use shares as collateral for the advancement of personal or company loans. Therefore, the directors have to conduct more "buy" rather than "sell" to maintain the share price to avoid the decline in the value of the collateral. It is common for the directors of the same firm to convey inconsistent trading signals and / or to reverse their trade direction. Such reversals affect the share price reaction of the firms concerned. Therefore, the "Mixed" trading signals generate less significant share price movement.

Tests are conducted to examine if the level of abnormal returns is affected by differences in the trading characteristics of the inside transactions. The results suggest that higher abnormal returns are related to higher proportion of informed trading; smaller firm size and lower directors' share-holding; and repeated inside transactions.

This study tests the two informational motives for insider trade by relating the intensity of insider trades and measures of information asymmetry. The findings are consistent with both the profit-seeking motive and signaling role for insider trade.

The tendency for the directors to trade is higher if there are more intangible assets in the total assets; better earnings performance, smaller sales value; larger variation in trading volume; and higher share price.

Theories have argued that insiders are motivated by the signaling function, insider profits and liquidity preference, to trade in the markets. Directors in Hong Kong are frequent and heavy traders of their firms' shares. If the directors conduct share transactions in an attempt to give signals to the market about the current mispricing of their firms' shares, they should not have so frequently reversed their trades in a short period of time. Furthermore, the purchase signals which may indicate the current undervaluation of their firms' shares, are not as effective as the sale signals. The sale signals cause the share price to decrease by a greater magnitude than the share price increase caused by purchase signals. The negative impact associated with the sale transaction outweighs the positive impact associated with purchase transaction on the share price movement. Another possible motive for the directors to trade is to make a market of their firms' shares in the market. This motive has not been explored and may become a topic for future research.

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Table 1

Summary Statistics of the Sample (1993 – 1999)

"Buy" consists of transactions where there is a net purchase of shares (purchases exceed sales). "Sell" consists of transactions where there is a net sale of shares (sales exceed purchases).

Panel A : Characteristics of Insider Trading Activity

	Number of Shares ('000,000)	Market Value (HK$'000,000)	Number of Transactions	Number of Firms	Average Firm Size (HK$'000)	Proportion of Informed Trading to Daily Trading Volume	Average Return (-150≤-1)
Buy	36,996	91,916	23,118	531	6,800,637	0.4074	0.0005
Sell	37,275	73,378	10,557	488	8,446,152	0.2519	0.0026
Buy / Sell	0.9925	1.2526	2.1898				
Total	74,271	165,293	33,675	580			
Average					6,598,863	0.3552	0.0012

Panel B : Distribution of Time Length between Two Consecutive Trades in terms of the Number of Trading Days

Time Length in terms of Number of Trading Days	Number of Transaction Records	Proportion over the Total Number of Transaction Records	Cumulative Percentage to the Total Transaction Records
1	5,497	29.31%	29.31%
2	2,133	11.37%	40.68%
3	1,601	8.54%	49.21%
4	1,162	6.20%	55.41%
5	957	5.10%	60.51%
6	579	3.09%	63.60%
7	461	2.46%	66.06%
8	350	1.87%	67.92%
9	313	1.67%	69.59%
10	282	1.50%	71.09%
11	224	1.19%	72.29%
12	208	1.11%	73.40%
13	147	0.78%	74.18%
14	146	0.78%	74.96%
15	109	0.58%	75.54%
16	121	0.65%	76.18%
17	116	0.62%	76.80%
18	100	0.53%	77.34%
19	103	0.55%	77.89%
20	70	0.37%	78.26%
21 - 50	1757	9.37%	87.63%
51 - 100	1085	5.78%	93.41%
101 -150	440	2.35%	95.76%
151-200	251	1.34%	97.09%
201-250	137	0.73%	97.82%
251-300	109	0.58%	98.41%
301-350	67	0.36%	98.76%
351-400	50	0.27%	99.03%
401-450	38	0.20%	99.23%
451-500	31	0.17%	99.40%
501-1000	104	0.55%	99.95%
>1000	9	0.05%	100.00%

Table 2

Average Abnormal Returns (AARs) and Cumulative Abnormal Returns (CARs) for the Overall, Buy, Sell, Sole Purchase, Sole Sale and Mixed Transactions Samples from 10 Days Prior to 360 Days After the Inside Transaction Date

The "Overall" sample includes net purchase and net sale transactions. The "Buy" sample consists of transactions where there is a net purchase of shares (purchases exceed sales). The "Sell" sample consists of transactions where there is a net sale of shares (sales exceed purchase). The "Sole Purchase" sample consists of transactions where there are only purchase transactions in the 60 trading days before and after the purchase at t = 0. The "Sole Sale" sample consists of transactions where there are only sale transactions in the 60 trading days before and after the sale at t = 0. The "Mixed Transactions" sample consists of firms that have both purchases and sales in the 60 trading days before and after the transaction at t = 0. N is the number of observations in the sample. The abnormal returns for insider sales are multiplied by negative one. t-statistics for AARs and CARs are shown in parentheses.

Panel A : Sample Period between 1993 and 1999

Event Day	Overall (N = 9385)	Buy (N = 6421)	Sell (N = 2964)	Sole Purchase (N = 3635)	Sole Sale (N = 1289)	Mixed Transaction (N = 4461)
	AAR / CAR (t – statistics)					
-10-1	-0.0086	-0.0074	-0.0109	-0.0057	-0.0188	-0.0074
	(-4.40)**	(-3.14)**	(-3.23)**	(-1.69)	(-3.62)**	(-2.80)**
-1+1	-0.0047	-0.0018	-0.0104	-0.0026	-0.0089	-0.0049
	(-4.41)**	(-1.41)	(-5.65)**	(-1.40)	(-3.14)**	(-3.36)**
-3+3	-0.0052	-0.0042	-0.0071	-0.0056	-0.0066	-0.0045
	(-3.16)**	(-2.13)*	(-2.53)*	(-1.97)*	(-1.52)	(-2.01)*
0	-0.0023	-0.0001	-0.0068	-0.0004	-0.0045	-0.0030
	(-3.78)**	(-0.12)	(-6.38)**	(-0.38)	(-2.77)**	(-3.57)**
+1+2	0.0019	0.0001	0.0053	-0.0003	0.0045	0.0026
	(2.15)*	(0.11)	(3.51)**	(-0.21)	(1.96)*	(2.16)*
+1+3	0.0021	-0.0003	0.0067	-0.0008	0.0059	0.0030
	(1.99)*	(-0.21)	(3.66)**	(-0.45)	(2.09)*	(2.05)*
+10+60	0.0118	-0.0074	0.0476	-0.0074	0.0528	0.0119
	(2.67)**	(-1.38)	(6.26)**	(-0.97)	(4.51)**	(1.99)*
+10+120	0.0148	-0.0240	0.0870	-0.0189	0.0692	0.0202
	(2.27)*	(-3.05)**	(7.76)**	(-1.67)	(4.01)**	(2.29)*
+10+240	0.0322	-0.0323	0.1526	0.0067	0.0757	0.0353
	(3.43)**	(-2.84)**	(9.44)**	(0.41)	(3.04)**	(2.77)**
+10+360	0.0177	-0.0620	0.1697	0.0353	0.0748	-0.0106
	(1.53)	(-4.43)**	(8.52)**	(1.75)	(2.44)*	(-0.68)

Table 2 (continued)

Average Abnormal Returns (AARs) and Cumulative Abnormal Returns (CARs) for the Overall, Buy, Sell, Sole Purchase, Sole Sale and Mixed Transactions Samples from 10 Days Prior to 360 Days After the Inside Transaction Date

Panel B : Sample Period between 1993 and 1997

Event Day	Overall (N = 7207)	Buy (N = 4874)	Sell (N = 2333)	Sole Purchase (N = 2629)	Sole Sale (N = 956)	Mixed Transaction (N = 3622)
	AAR / CAR (t – statistics)					
-10-1	-0.0039	-0.0011	-0.0091	0.0021	-0.0163	-0.0042
	(-1.96)*	(-0.50)	(-2.65)**	(0.64)	(-2.86)**	(-1.44)
-1+1	-0.0033	0.0008	-0.0113	0.0018	-0.0111	-0.0043
	(-3.03)**	(0.67)	(-6.00)**	(1.00)	(-3.55)**	(-2.72)**
-3+3	-0.0021	0.0005	-0.0074	0.0011	-0.0087	-0.0024
	(-1.29)	(0.28)	(-2.57)**	(0.40)	(-1.81)	(-0.98)
0	-0.0022	0.0006	-0.0077	0.0005	-0.0064	-0.0028
	(-3.55)**	(0.83)	(-7.11)**	(0.52)	(-3.56)**	(-3.08)**
+1+2	0.0024	0.0009	0.0053	0.0014	0.0035	0.0028
	(2.74)**	(0.90)	(3.45)**	(0.97)	(1.37)	(2.14)*
+1+3	0.0027	0.0005	0.0070	0.0010	0.0044	0.0033
	(2.51)**	(0.37)	(3.72)**	(0.54)	(1.41)	(2.11)*
+10+60	0.0171	0.0010	0.0474	0.0025	0.0646	0.0132
	(3.83)**	(0.19)	(6.09)**	(0.34)	(5.02)**	(2.03)*
+10+120	0.0169	-0.0216	0.0895	-0.0191	0.0954	0.0179
	(2.57)**	(-2.84)**	(7.80)**	(-1.77)	(5.02)**	(1.86)
+10+240	0.0441	-0.0140	0.1531	0.0213	0.1107	0.0403
	(4.65)**	(1.28)	(9.25)**	(1.37)	(4.04)**	(2.90)**
+10+360	0.0462	-0.0180	0.1669	0.0757	0.1135	0.0105
	(3.96)**	(-1.33)	(8.18)**	(3.96)**	(3.36)**	(0.61)

Table 2 (continued)

Average Abnormal Returns (AARs) and Cumulative Abnormal Returns (CARs) for the Overall, Buy, Sell, Sole Purchase, Sole Sale and Mixed Transactions Samples from 10 Days Prior to 360 Days After the Inside Transaction Date

Panel C : Sample Period between 1998 and 1999

Event Day	Overall (N = 2178)	Buy (N = 1547)	Sell (N = 631)	Sole Purchase (N = 1006)	Sole Sale (N = 333)	Mixed Transaction (N = 839)
	AAR / CAR (t – statistics)					
-10-1	-0.0288	-0.0343	-0.0184	-0.0341	-0.0264	-0.0250
	(-5.63)**	(-5.25)**	(-1.85)	(-3.99)**	(-2.07)*	(-3.49)**
-1+1	-0.0108	-0.0130	-0.0065	-0.0179	-0.0022	-0.0080
	(-3.85)**	(-3.63)**	(-1.20)	(-3.83)**	(-0.31)	(-2.05)*
-3+3	-0.0181	-0.0244	-0.0061	-0.0293	-0.0004	-0.0158
	(-4.22)**	(-4.47)**	(-0.73)	(-4.10)**	(-0.04)	(-2.64)**
0	-0.0029	-0.0029	-0.0027	-0.0036	0.0012	-0.0040
	(-1.76)	(-1.42)	(-0.86)	(-1.35)	(0.31)	(-1.74)
+1+2	-0.0004	-0.0032	0.0051	-0.0065	0.0078	0.0015
	(-0.16)	(-1.11)	(1.16)	(-1.70)	(1.36)	(0.48)
+1+3	-0.0003	-0.0033	0.0055	-0.0073	0.0107	0.0011
	(-0.10)	(-0.93)	(1.02)	(-1.55)	(1.53)	(0.27)
+10+60	-0.0139	-0.0479	0.0486	-0.0515	0.0111	0.0053
	(-1.20)	(-3.25)**	(2.17)*	(-2.67)**	(0.39)	(0.33)
+10+120	0.0061	-0.0312	0.0740	-0.0120	-0.0261	0.0366
	(0.36)	(-1.44)	(2.24)*	(-0.42)	(-0.61)	(1.53)
+10+240	-0.0307	-0.1227	0.1521	-0.0520	-0.0723	0.0033
	(-1.25)	(-3.91)**	(3.19)**	(-1.27)	(-1.18)	(0.10)
+10+360	-0.1495	-0.2918	0.2004	-0.1411	-0.1004	-0.1646
	(-4.93)**	(-7.55)**	(3.41)**	(-2.79)**	(-1.33)	(-3.88)**

** significant at 0.01 level
* significant at 0.05 level

Table 3

Regression Analysis (equation (4))

$$CAR = \alpha_0 + \beta_1 PROP + \beta_2 SIGN + \beta_3 CONSENSUS + \beta_4 FSIZE + \beta_5 OWN + \beta_6 DATE$$

CAR is the abnormal return over different time periods. PROP is the trade size of the directors on day t. SIGN is a dummy variable for the direction of transaction which takes the value of 1 if the trade is a "Buy" and 0 otherwise. CONSENSUS is a variable for the net number of transactions. FSIZE represents firm size. OWN is the ownership percentage of directors. DATE is a variable for the time length (in terms of the number of trading days) between two consecutive trades and takes the value of 1 if the time length between two consecutive trades is greater than 10 days and 0 otherwise.

Panel A : Summary Statistics

	PROP	SIGN	CONSENSUS	FSIZE	OWN	DATE
Average	0.3531	0.6842	0.0535	13.9437	0.2823	0.2875
Standard Deviation	0.3207	0.4649	0.1960	1.6433	0.2678	0.4526
Maximum	1.0000	1.0000	1.0000	19.2557	0.9977	1.0000
Minimum	0.0000	0.0000	0.0000	7.1467	0.0000	0.0000

Panel B : Regression Results

	$10 \le t \le -1$	$1 \le t \le +1$	$-3 \le t \le +3$	$t = 0$	$10 \le t \le 120$	$10 \le t \le 240$	$10 \le t \le 360$
	Beta Coefficient (t – statistic)						
Intercept	-0.0275	-0.0077	-0.0053	-0.0042	0.1680	0.2710	0.1130
	(-1.81)	(-0.81)	(-0.39)	(-0.58)	(4.06)	(4.62)	(1.61)
PROP	0.0750	0.0430	0.0480	0.0480	-0.0100	-0.0090	0.0040
	(5.96)**	(3.42)**	(3.83)**	(3.45)**	(-0.83)	(-0.72)	(0.30)
SIGN	0.0080	0.0330	0.0050	0.0410	-0.1120	-0.1110	-0.1030
	(0.63)	(2.76)**	(0.42)	(3.07)**	(-9.25)**	(-9.16)**	(-8.55)**
CONSENSUS	0.0370	0.0060	0.0240	-0.0140	-0.0080	-0.0030	0.0020
	(3.11)**	(0.49)	(2.04)*	(-1.08)	(-0.67)	(-0.22)	(0.13)
FSIZE	0.0040	-0.0050	-0.0070	-0.0060	-0.0330	-0.0390	-0.0050
	(0.31)	(-0.42)	(-0.54)	(-0.46)	(-2.63)**	(-3.16)**	(-0.44)
OWN	-0.0070	-0.0130	-0.0100	-0.0240	-0.0090	0.0040	-0.0030
	(-0.57)	(-1.14)	(-0.87)	(-1.84)	(-0.80)	(0.30)	(-0.24)
DATE	-0.0020	-0.0210	-0.0250	-0.0130	-0.0090	-0.0060	0.0150
	(-0.15)	(-1.80)	(-2.15)*	(-0.95)	(-0.79)	(-0.56)	(1.30)
Adjusted R^2	0.0060	0.0040	0.0030	0.0050	0.0120	0.0120	0.0100
F	8.2900	5.7740	4.9210	6.0450	16.0780	16.0360	13.5570
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

** significant at 0.01 level
* significant at 0.05 level

Table 4

Regression Analysis (equation (5))

$$\text{Insider} = \alpha_0 + \beta_1 \text{ INTANGIBLE} + \beta_2 \text{ LossD} + \beta_3 \text{ LnSALE} + \beta_4 \text{ SDVOL} + \beta_5 \text{ FSIZE} + \beta_6 \text{ AvgRet}$$

Insider is the log measure of the insider trading activity for the year. The measures are in terms of the total values of the number of shares, market value and number of transactions traded by the directors. INTANGIBLE is the ratio of the book value of intangibles to the total assets. LossD is a dummy variable which takes the value of 1 if the net income is negative and 0 otherwise. LnSALE is the log value of sales. SDVOL is the ratio of the standard deviation of monthly trading volume over 36 months before the trading month to the number of outstanding shares. FSIZE is the firm size. AvgRet is the average return of the firm for 150 days before the trade. t-statistics are adjusted for heteroskedasticity using White's (1980) procedure.

Panel A : Summary Statistics

	INTANGIBLE	LossD	LnSALE	SDVOL	FSIZE	AvgRet
Average	0.011694	0.133797	13.451850	0.111656	13.723730	0.001262
Standard Deviation	0.000000	0.340566	13.533660	0.040939	13.576690	0.000932
Maximum	0.397395	1.00000	17.024260	8.224670	18.853280	0.051920
Minimum	0.000000	0.00000	6.918695	0.000028	7.210006	-0.055453

Panel B : Regression Results

	Total Number of Shares	Total Market Value	Total Number of Transactions
		Beta Coefficient (t – statistic)	
Intercept	4.4187	-2.6084	2.1076
	(5.41)**	(-3.21)*	(5.18)**
INTANGIBLE	3.0749	3.5886	-0.7747
	(2.28)*	(2.66)**	(-0.99)
LossD	0.0811	-0.4069	-0.1223
	(0.41)	(-2.09)*	(-1.16)
LnSALE	-0.1348	-0.1884	-0.0091
	(-2.64)**	(-3.34)**	(-0.31)
SDVOL	0.7426	0.3053	0.2707
	(3.78)**	(2.87)**	(5.39)**
FSIZE	-0.0599	0.5481	0.0366
	(-1.14)	(8.37)**	(1.35)
AvgRet	18.7837	28.2153	-5.1167
	(1.66)	(2.52)*	(-0.66)
Adjusted R^2	0.0336	0.1205	0.0061
F	8.4862	30.4971	2.3228
	(0.00)	(0.00)	(0.03)

** significant at 0.01 level
* significant at 0.05 level

Appendix 1

Average Abnormal Returns (AARs) and Cumulative Abnormal Returns (CARs) from 10 Days Prior to 360 Days After the Inside Transaction Date

(Different Subsamples of "No Transaction Prior")

The "Overall" sample includes net purchase and net sale transactions. The "Buy" sample consists of transactions where there is a net purchase of shares (purchases exceed sales). The "Sell" sample consists of transactions where there is a net sale of shares (sales exceed purchase). The "Sole Purchase" sample consists of transactions where there are only purchase transactions in the 60 trading days before and after the purchase at t = 0. The "Sole Sale" sample consists of transactions where there are only sale transactions in the 60 trading days before and after the sale at t = 0. The "Mixed Transactions" sample consists of firms that have both purchases and sales in the 60 trading days before and after the transaction at t = 0. N is the number of observations in the sample. The abnormal returns for insider sales are multiplied by negative one. t-statistics for AARs and CARs are shown in parentheses.

Panel A : No Transaction 5 Days Prior

Event Day	Overall (N = 3890)	Buy (N = 2469)	Sell (N = 1421)	Sole Purchase (N = 1830)	Sole Sale (N = 917)	Mixed Transaction (N = 1143)
	AAR / CAR (t – statistics)					
-10-1	-0.0131	-0.0117	-0.0151	-0.0119	-0.0184	-0.0104
	(-4.51)**	(-2.92)**	(-3.24)**	(-2.48)*	(-3.07)**	(-2.24)*
-1+1	-0.0078	-0.0029	-0.0153	-0.0025	-0.0173	-0.0071
	(-4.89)**	(-1.30)	(-5.98)**	(-0.95)	(-5.27)**	(-2.82)**
-3+3	-0.0105	-0.0080	-0.0144	-0.0099	-0.0161	-0.0068
	(-4.31)**	(-2.36)*	(-3.68)**	(-2.46)*	(-3.21)**	(-1.75)
0	-0.0031	0.0010	-0.0093	0.0007	-0.0097	-0.0028
	(-3.33)**	(0.79)	(-6.31)**	(0.48)	(-5.13)**	(-1.89)
+1+2	0.0024	0.0009	0.0048	0.0001	0.0057	0.0029
	(1.87)	(0.48)	(2.30)*	(0.04)	(2.12)*	(1.40)
+1+3	0.0026	0.0007	0.0056	-0.0012	0.0060	0.0049
	(1.66)	(0.32)	(2.17)*	(-0.45)	(1.83)	(1.93)
+10+60	0.0109	-0.0011	0.0294	0.0004	0.0319	0.0086
	(1.67)	(-0.12)	(2.79)**	(0.04)	(2.35)*	(0.82)
+10+120	0.0234	-0.0002	0.0594	0.0035	0.0574	0.0233
	(2.42)*	(-0.01)	(3.82)**	(0.22)	(2.87)**	(1.51)
+10+240	0.0234	-0.0002	0.0594	0.0035	0.0574	0.0233
	(1.68)	(-0.01)	(2.65)**	(0.15)	(1.99)*	(1.04)
+10+360	0.0386	0.0045	0.0899	0.0534	0.0951	-0.0252
	(2.24)*	(0.19)	(3.25)**	(1.88)	(2.67)**	(-0.92)

Panel B : No Transaction 10 Days Prior

Event Day	Overall (N = 2923)	Buy (N = 1792)	Sell (N = 1131)	Sole Purchase (N = 1390)	Sole Sale (N = 796)	Mixed Transaction (N = 737)
			AAR / CAR (t – statistics)			
-10-1	-0.0149	-0.0114	-0.0195	-0.0110	-0.0210	-0.0140
	(-4.40)**	(-2.42)*	(-3.74)**	(-1.96)*	(-3.37)**	(-2.44)*
-1+1	-0.0097	-0.0040	-0.0178	-0.0051	-0.0193	-0.0067
	(-5.26)**	(-1.54)	(-6.22)**	(-1.64)	(-5.66)**	(-2.14)*
-3+3	-0.0138	-0.0105	-0.0184	-0.0132	-0.0183	-0.0101
	(-4.89)**	(-2.67)**	(-4.23)**	(-2.79)**	(-3.51)**	(-2.10)*
0	-0.0037	0.0008	-0.0100	0.0004	-0.0099	-0.0035
	(-3.44)**	(0.53)	(-6.05)**	(0.22)	(-5.00)**	(-1.90)
+1+2	0.0021	-0.0007	0.0061	-0.0020	0.0061	0.0042
	(1.40)	(-0.34)	(2.60)**	(-0.78)	(2.18)*	(1.65)
+1+3	0.0020	-0.0014	0.0068	-0.0035	0.0075	0.0048
	(1.10)	(-0.54)	(2.37)*	(-1.15)	(2.20)*	(1.52)
+10+60	0.0039	-0.0074	0.0196	-0.0025	0.0258	-0.0089
	(0.51)	(-0.69)	(1.67)	(-0.20)	(1.83)	(-0.68)
+10+120	0.0143	-0.0022	0.0376	0.0056	0.0464	-0.0053
	(1.27)	(-0.14)	(2.17)*	(0.30)	(2.23)*	(-0.28)
+10+240	0.0143	-0.0022	0.0376	0.0056	0.0464	-0.0053
	(0.88)	(-0.10)	(1.50)	(0.21)	(1.55)	(-0.19)
+10+360	0.0391	0.0130	0.0758	0.0660	0.0896	-0.0551
	(1.96)*	(0.47)	(2.46)*	(1.98)*	(2.42)*	(-1.62)

Panel C : No Transaction 15 Days Prior

Event Day	Overall (N = 2516)	Buy (N = 1528)	Sell (N = 988)	Sole Purchase (N = 1212)	Sole Sale (N = 725)	Mixed Transaction (N = 579)
			AAR / CAR (t – statistics)			
-10-1	-0.0142	-0.0097	-0.0202	-0.0111	-0.0211	-0.0111
	(-3.82)**	(-1.87)	(-3.58)**	(-1.80)	(-3.21)**	(-1.66)
-1+1	-0.0089	-0.0022	-0.0180	-0.0035	-0.0200	-0.0044
	(-4.34)**	(-0.79)	(-5.83)**	(-1.04)	(-5.54)**	(-1.21)
-3+3	-0.0139	-0.0100	-0.0195	-0.0131	-0.0200	-0.0080
	(-4.47)**	(-2.30)*	(-4.12)**	(-2.53)*	(-3.64)**	(-1.43)
0	-0.0025	0.0020	-0.0087	0.0013	-0.0094	-0.0006
	(-2.10)*	(1.19)	(-4.87)**	(0.69)	(-4.54)**	(-0.28)
+1+2	0.0014	-0.0016	0.0054	-0.0030	0.0058	0.0035
	(0.82)	(-0.69)	(2.15)*	(-1.08)	(1.96)*	(1.16)
+1+3	0.0008	-0.0025	0.0052	-0.0042	0.0060	0.0030
	(0.38)	(-0.87)	(1.70)	(-1.24)	(1.66)	(0.81)
+10+60	0.0034	-0.0067	0.0174	-0.0024	0.0253	-0.0127
	(0.40)	(-0.57)	(1.37)	(-0.17)	(1.71)	(-0.85)
+10+120	0.0085	-0.0090	0.0330	-0.0008	0.0452	-0.0193
	(0.69)	(-0.52)	(1.76)	(-0.04)	(2.06)*	(-0.87)
+10+240	0.0085	-0.0090	0.0330	-0.0008	0.0452	-0.0193
	(0.48)	(-0.36)	(1.22)	(-0.03)	(1.43)	(-0.60)
+10+360	0.0349	0.0026	0.0809	0.0453	0.1049	-0.0671
	(1.58)	(0.08)	(2.42)*	(1.24)	(2.69)**	(-1.70)

Appendix 1 (continued)

Panel D : No Transaction 20 Days Prior

Event Day	Overall (N = 2259)	Buy (N = 1374)	Sell (N = 885)	Sole Purchase (N = 1110)	Sole Sale (N = 670)	Mixed Transaction (N = 479)
	AAR / CAR (t – statistics)					
-10-1	-0.0129	-0.0069	-0.0209	-0.0088	-0.0239	-0.0054
	(-3.22)**	(-1.28)	(-3.47)**	(-1.37)	(-3.48)**	(-0.69)
-1+1	-0.0098	-0.0036	-0.0184	-0.0040	-0.0200	-0.0070
	(-4.45)**	(-1.22)	(-5.58)**	(-1.15)	(-5.31)**	(-1.64)
-3+3	-0.0140	-0.0103	-0.0192	-0.0115	-0.0199	-0.0106
	(-4.16)**	(-2.27)*	(-3.80)**	(-2.14)*	(-3.46)**	(-1.63)
0	-0.0029	0.0013	-0.0087	0.0014	-0.0087	-0.0032
	(-2.25)*	(0.77)	(-4.56)**	(0.68)	(-3.98)**	(-1.30)
+1+2	0.0009	-0.0028	0.0060	-0.0034	0.0060	0.0023
	(0.51)	(-1.16)	(2.23)*	(-1.20)	(1.96)*	(0.65)
+1+3	0.0002	-0.0033	0.0049	-0.0042	0.0055	0.0013
	(0.08)	(-1.10)	(1.49)	(-1.20)	(1.45)	(0.31)
+10+60	0.0002	-0.0081	0.0118	-0.0040	0.0197	-0.0171
	(0.02)	(-0.67)	(0.87)	(-0.28)	(1.27)	(-0.97)
+10+120	0.0051	-0.0090	0.0247	0.0010	0.0379	-0.0307
	(0.38)	(-0.50)	(1.23)	(0.05)	(1.65)	(-1.18)
+10+240	0.0051	-0.0090	0.0247	0.0010	0.0379	-0.0307
	(0.26)	(-0.35)	(0.85)	(0.03)	(1.15)	(-0.82)
+10+360	0.0323	0.0041	0.0720	0.0542	0.0951	-0.0962
	(1.35)	(0.13)	(2.01)*	(1.43)	(2.33)*	(-2.08)*

** significant at 0.01 level
* significant at 0.05 level

Appendix 2

Average Abnormal Returns (AARs) and Cumulative Abnormal Returns (CARs) for the Overall, Buy, Sell, Sole Purchase, Sole Sale and Mixed Transactions Samples from 10 Days Prior to 360 Days After the Inside Transaction Date (Using a Shorter Window (30 Days) For Subsample Classification)

The "Overall" sample includes net purchase and net sale transactions. The "Buy" sample consists of transactions where there is a net purchase of shares (purchases exceed sales). The "Sell" sample consists of transactions where there is a net sale of shares (sales exceed purchase). The "Sole Purchase" sample consists of transactions where there are only purchase transactions in the 30 trading days before and after the purchase at t = 0. The "Sole Sale" sample consists of transactions where there are only sale transactions in the 30 trading days before and after the sale at t = 0. The "Mixed Transactions" sample consists of firms that have both purchases and sales in the 30 trading days before and after the transaction at t = 0. N is the number of observations in the sample. The abnormal returns for insider sales are multiplied by negative one. t-statistics for AARs and CARs are shown in parentheses.

Event Day	Overall (N = 9385)	Buy (N = 6421)	Sell (N = 2964)	Sole Purchase (N = 4510)	Sole Sale (N = 1671)	Mixed Transaction (N = 3204)
	AAR / CAR (t – statistics)					
-10-1	-0.0086	-0.0074	-0.0109	-0.0093	-0.0174	-0.0030
	(-4.40)**	(-3.14)**	(-3.23)**	(-3.04)**	(-4.11)**	(-1.03)
-1+1	-0.0047	-0.0018	-0.0104	-0.0018	-0.0117	-0.0045
	(-4.41)**	(-1.41)	(-5.65)**	(-1.09)	(-5.07)**	(-2.81)**
-3+3	-0.0052	-0.0042	-0.0071	-0.0060	-0.0091	-0.0022
	(-3.16)**	(-2.13)*	(-2.53)*	(-2.34)*	(-2.56)**	(-0.89)
0	-0.0023	-0.0001	-0.0068	0.0001	-0.0063	-0.0032
	(-3.78)**	(-0.12)	(-6.38)**	(0.14)	(-4.72)**	(-3.53)**
+1+2	0.0019	0.0001	0.0053	-0.0002	0.0049	0.0028
	(2.15)*	(0.11)	(3.51)**	(-0.15)	(2.60)**	(2.14)*
+1+3	0.0021	-0.0003	0.0067	-0.0010	0.0062	0.0037
	(1.99)*	(-0.21)	(3.66)**	(-0.59)	(2.70)**	(2.30)*
+10+60	0.0118	-0.0074	0.0476	0.0010	0.0457	0.0062
	(2.67)**	(-1.38)	(6.26)**	(0.15)	(4.78)**	(0.94)
+10+120	0.0148	-0.0240	0.0870	-0.0061	0.0632	0.0134
	(2.27)*	(-3.05)**	(7.76)**	(-0.60)	(4.48)**	(1.38)
+10+240	0.0322	-0.0323	0.1526	-0.0061	0.0632	0.0134
	(3.43)**	(-2.84)**	(9.44)**	(-0.42)	(3.11)**	(0.96)
+10+360	0.0177	-0.0620	0.1697	0.0214	0.0738	-0.0166
	(1.53)	(-4.43)**	(8.52)**	(1.18)	(2.94)**	(-0.96)

** significant at 0.01 level
* significant at 0.05 level

Appendix 3

Regression Analysis (equation (5) Using Different Insider Trading Measures)

$$\text{Insider} = \alpha_0 + \beta_1 \text{ INTANGIBLE} + \beta_2 \text{ LossD} + \beta_3 \text{ LnSALE} + \beta_4 \text{ SDVOL} + \beta_5 \text{ FSIZE} + \beta_6 \text{ AvgRet}$$

Insider is estimated by three measures, the informed trading volume in percentage of shares outstanding, informed trading value in percentage of firm market value and informed trading volume in percentage of daily trading volume. INTANGIBLE is the ratio of the book value of intangibles to the total assets. LossD is a dummy variable which takes the value of 1 if the net income is negative and 0 otherwise. LnSALE is the log value of sales. SDVOL is the ratio of the standard deviation of monthly trading volume over 36 months before the trading month to the number of outstanding shares. FSIZE is the firm size. AvgRet is the average return of the firm for 150 days before the trade. t-statistics are adjusted for heteroskedasticity using White's (1980) procedure.

	Informed Trading Volume in Percentage of Shares Outstanding	Informed Trading Value in Percentage of Firm Market Value	Informed Trading Volume in Percentage of Daily Volume
		Beta Coefficient (t – statistic)	
Intercept	0.4017	0.3979	1.5739
	(1.78)	(1.77)	(14.77)
INTANGIBLE	-0.1583	-0.1775	-0.1194
	(-1.04)	(-1.16)	(-0.43)
LossD	-0.0296	-0.0188	-0.0872
	(-0.84)	(-0.49)	(-2.66)**
LnSALE	0.0291	0.0299	-0.0124
	(0.93)	(0.96)	(-1.36)
SDVOL	-0.0008	-0.0011	-0.0411
	(-0.11)	(-0.15)	(-1.49)
FSIZE	-0.0556	-0.0562	-0.0733
	(-1.22)	(-1.24)	(-8.93)**
AvgRet	1.7855	1.4568	-3.1762
	(1.33)	(1.05)	(-1.52)
Adjusted R^2	0.0305	0.0305	0.1234
F	7.7641	7.7664	24.1575
p-value	0.00	0.00	0.00

** significant at 0.01 level
* significant at 0.05 level

Essay 2

Do Insiders Have "Inside Information" on Aggregate Market Returns ?

Abstract

This study examines the causality relation between lagged aggregate insider trading activity and general market movement. The vector autoregressive analysis (VAR) finds a strong causality relation. The causality relation is more significant when daily and weekly data are used. This result may be due to the more timely reporting requirement and disclosure procedures for insider trading in Hong Kong. The insider sales are very frequent and, in contrast with the US findings, the lagged insider sales appear to influence subsequent market returns.

Essay 2

Do Insiders Have "Inside Information" on Aggregate Market Returns ?

I. Introduction

Many studies have documented that insider trading in a given firm can predict firm-specific future share price movement for the firm concerned (Jaffe 1974; Seyhun 1986). The positive correlation between insider trading and future share price movement indicates that the informed insider trades promote price discovery of a particular share at a rapid pace. The significant correlation between different insider trading strategies (buy or sell) and subsequent share price movement is a piece of evidence showing that insider trading identifies and corrects mispricing in the right direction. Furthermore, the voluminous studies conducted to examine the insider trading activities around the corporate announcements suggest that insiders trade with firm-specific information (e.g., Lamba and Khan 1999; Kahle 2000; Sivakumar and Vijayakumar 2001). Therefore, if insider purchase (sale) is a signal to a future increase (decrease) in the share price of a given firm, it appears that insider trading activity is just a firm-specific phenomenon.

However, if the general market movement is a reflection of the share price changes of all the firms in the market, it is possible to propose that insider trading, in aggregate, can predict the future market return (Seyhun 1988; Seyhun 1992; Chowdhury, Howe and Lin 1993). If there is a positive correlation between insider trading and share price movement of the firm concerned, it is also expected that there will be a positive correlation between the aggregate insider trading and future market movement as a whole. Insider trading then facilitates the pricing efficiency of the whole market.

A potential relation between the aggregate insider trading and economy-wide factors to predict future market returns has been established using aggregate insider trading data of the US (Seyhun 1988; Seyhun 1992; Chowdhury, Howe and Lin 1993). This study, using the Hong Kong insider trading data, examines the association between the insider trading activity and the market movement as a whole.

The official reporting requirements and disclosure procedures in Hong Kong differ markedly from that of the US. The directors of the firms are required by the Laws of Hong Kong (Chapter 396) to disclose their dealings in their firms' shares within five days of the transaction to the Hong Kong Exchange. The securities trading information is disclosed to the public the next business day by way of the Securities (Disclosure of Interest) (SDI) Daily Summary and Directors'/Chief Executives' Notification Report.

In the US, according to Section 16(a) of the Securities and Exchange Act of 1934, insiders are required to report their securities transactions to the Securities and Exchange Commission within ten days after the end of the calendar month in which the transaction occurs. This disclosure rule allows a reporting delay of a minimum of ten days to a maximum of forty days. The securities trading information of the US insiders is reported in a monthly publication called the Official Summary of Securities Transactions and Holdings[1]. Therefore, the reporting requirement in Hong Kong is more timely than that in the US. This study examines the influence of insider trading activity on the general market movement where there is a more timely official disclosure of informed securities transaction information to the public.

[1] There are other means available in the US to reveal the insider trading information to the market in a more timely fashion. As soon as the insiders submit their trading reports to the Securities and Exchange Commission, the information is transmitted to investors through an on-line service called "Insider Trading Monitor" and later disclosed in publications such as Wall Street Journal, Baron's and Insiders' Chronicle.

If a significant association can be established between the aggregate insider trading and economy-wide activity using Hong Kong data, then this study will provide further evidence on the hypothesized relation between insider trading activity and future market returns. This association may yield insights into the reasons that drive the insiders to trade. Besides using data from a securities market where the legal and trading environments are different from the US, this study also examines the relation using daily data. Comparison of the causality relation (using a vector autoregressive (VAR) model) over different time horizons indicates how fast the influence of the aggregate insider trading activity is reflected in market returns.

The findings of this study show that insider trading exerts certain impacts on the market movement. However, the informativeness of the aggregate insider trading activity in predicting subsequent market returns depends on the time horizon under examination. The predictive power of insider trading activity is stronger in shorter time horizons (on a daily and weekly basis). This short horizon relation between aggregate insider trading activity and market returns may be due to the more timely reporting requirement and disclosure procedures in Hong Kong. The predictability of the lagged aggregate insider sales is relatively higher than for lagged insider purchases. A regression model finds none of the predictors tested is informative in explaining subsequent market movement. The insignificant results may be due to the use of monthly data.

This essay proceeds as follows. Section II presents the literature review and hypothesis development of the study. Data and Methodology are described in Section III. Section IV reports the empirical results and Section V concludes the study.

II. Literature Review and Hypothesis Development

The potential relation between informed trading and general market movement was first examined using the investment trading data of mutual fund managers (Kon 1983; Henricksson 1984; Jagannathan and Korajczyk 1986; Grinblatt and Titman 1994; Bollen and Busse 2001). It was hypothesized that the mutual fund managers would time their investment trading in accordance with their prediction about the future market movement.

Seyhun (1988; 1992) and Chowdhury, Howe and Lin (1993) examine if there is a tendency for the insiders to increase their holdings of shares prior to the increase in general market returns and decrease their holdings of shares prior to the decrease in general market returns. If the trades of the insiders are in response to the firm-specific, industry-wide or economy-wide factors, analyses of the insider trading can uncover the effects of economy-wide factors not currently reflected in the share prices[2]. A positive relation between the insider trading and economy-wide activity would be expected if the mispricing is partly caused by economy-wide factors that are not yet reflected in the share prices. This implies that the trading pattern of the insiders reflects the effects of economy-wide and firm-specific factors. An unusual increase in share purchases by insiders in the aggregate can be hypothesized as a signal to a coming increase in general market price, and an unusual increase in share sales by insiders in the aggregate can be hypothesized as a signal to a forthcoming decline in general market price.

Seyhun (1988; 1992) finds that aggregate insider trading is informative in predicting future market returns and in signaling future macroeconomic activity. There is a positive relation between past aggregate insider trading activity and future

stock returns. Seyhun (1988) reports that the changes in the economy-wide activity are recognized about two months after the insiders' transactions. Later, Seyhun (1992), from the analysis of inside transactions of those firms trading on the New York Stock Exchange, American Stock Exchange and Over-the-Counter market, shows that the previous 12-month aggregate insider trading activity explains up to 40% of the variation in 6-month future stock market return. However, Chowdhury, Howe and Lin (1993) observe only slight predictive power of insider trading activity from a sample of firms selected from the New York and American Stock Exchanges.

Based upon the framework of Chowdhury, Howe and Lin (1993), this study employs a vector autoregressive (VAR) model to examine the causality relation between market return and lagged aggregate insider trading activity under different time horizons. Following the US research, a positive correlation between market movement and informed trading activity is expected. The relation will be more significant when the time horizon examined is shorter.

The fads hypothesis suggests that share returns contain predictable, irrational and mean-reverting elements. Many empirical works have been devoted to finding the best predictor of share returns (Campbell 1987; Breen, Glosten and Jagannathan 1989; Hodrick 1992; Lee 1992; Goetzmann and Jorion 1993; Cochrane 1994; Lee 1996; Lamont 1998; Lee 1998; Lettau and Ludvigson 2001). The expected share returns reflect the changes in the business conditions and the fundamental values of the economy. In the short-run, the trading activities of the informed and noise traders may lead prices to deviate from their fundamental values. However, in the long-run, the prices should move back to the fundamental values. In order to examine this, a regression model is constructed to test the relative predictability of the past market

[2] Baker and Wurgler (2000), based on the results from in-sample tests, suggest that managers can predict future aggregate returns in real time. They find that there is a strong and negative correlation

return, aggregate insider trading activity and other variables (dividend yield, price-earnings ratio, interest rate and domestic export volume) that represent different aspects of business conditions and fundamental values, on the general market movement. The fads hypothesis states that aggregate insider trading activity predicts future market returns. In addition, the predictive power of insider trades should not be affected when additional predictors of market returns, such as past market returns, dividend yield, price-earnings ratio and interest rate, are added.

III. Data and Methodology

Data

This study examines the predictive power of insider trading activity on the general market movement (market return) over a 7-year period between 1993 and 1999. Market return is estimated by the Hong Kong Hang Seng Index (HSI) return and is retrieved from the Returns file of the PACAP database. The daily Hang Seng Index (HSI) return is calculated by the log value of the ratio of the Hang Seng Index (HSI) value at time t to the Hang Seng Index (HSI) value at time t-1. The weekly and monthly Hang Seng Index returns are the average of the daily Hang Seng Index returns for the week and the month respectively.

The data for insider trading transactions are extracted from the Directors' Dealing file of the Inside Trade Asia Database of Primark. The Primark database keeps an electronic record of equity transactions of directors from 1993 onwards. The directors of the listed firms are obligated by the Laws of Hong Kong (Chapter 396) to disclose their equity transactions to the Hong Kong Exchange within five trading days from the day the transactions are conducted. The source of insider trading data for the Primark database is the Securities (Disclosure of Interest) (SDI) Daily Summary and

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between the share of equity in total new issues and future aggregate equity market returns.

Directors' / Chief Executives' Notification Report issued by the Hong Kong Exchange.

This study includes only the open market transactions of directors in the securities market. Other types of inside transactions such as exercising options, warrants, bonus warrants and rights, the issue of bonus shares, the conversion of bonds and debentures, and special and scrip dividends are excluded (Lin and Howe 1990). Insider trading activity is measured in terms of the number of shares, the market value of shares and the number of transactions. Monthly, weekly and daily data are used.

Besides focusing on the relation between the general market movement and the aggregate insider trading activity, the predictability of other factors relating to the macroeconomic business conditions and fundamental values such as the dividend yield, price-earnings ratio, interest rate, and domestic export volume is also examined. The data for the monthly dividend yield, price-earnings ratio, interest rate, and export volume index are extracted from the Hang Seng Index Services Limited and DataStream.

Table 1 shows the summary statistics of returns and insider trading activity between 1993 and 1999. One major difference between the insider trading activity in the US and Hong Kong is the relative dominance of insider purchases over insider sales. In the US, insider sales are more common than insider purchases (Lee 1997; Seyhun 1998; Lakonishok and Lee 2001). Lakonishok and Lee report that the market values of purchase transactions and sale transactions by management are US$ 1,693 million (approximately HK$ 13,205 million) and US$ 8,016 million (approximately HK$ 62,524 million) respectively in the period from 1975 to 1995. The purchase to sale ratio is 0.21. As shown in Panel A of Table 1, the average purchase to sale ratios

for the number of shares, the market value, and the number of transactions are 1.12, 1.51, and 2.45, respectively. The preponderance of purchase transactions compared to sales in Hong Kong contrasts sharply with that of the US where insider sales are more popular than insider purchases. The higher frequency of insider purchase in Hong Kong may be due to the highly concentrated ownership structure in Hong Kong. It is a common practice for the directors to use their firms' shares as collateral for the advancement of personal or company loan. Therefore, the directors may have an interest to conduct more insider purchases in order to maintain the price of their shares to avoid the decline in the collateral value.

Table 1 Panel B shows the distribution of the length of time between two consecutive trades in terms of the number of trading days. The statistics show that the directors are frequent traders in the securities market. Nearly 30% of the total transaction records are conducted on a day-to-day basis. Another 30% of the transactions are followed by another in day 2 to day 5 after the original purchase or sale.

The statistics of the market return and aggregate insider activity are reported in Panel C (weekly data) and expressed diagrammatically in Figure 1 (monthly data). The average weekly market return is 0.07%. The average weekly purchased shares, market value, and transactions are 101 million, HK$ 252 million, and 63 respectively, and the corresponding numbers for sales are 102 million, HK$ 202 million, and 29 respectively. There is a relatively higher frequency of insider purchases than sales. The average weekly purchase to sale ratios are greater than one for all three measures of number of shares (7.47), market value (8.84), and number of transactions (3.54).

Previous studies in the US conclude that the difference in information content between insider purchases and insider sales is due to the trading frequency (Seyhun

1986; Lin and Howe 1990; Chowdhury, Howe and Lin 1993; Lakonishok and Lee 2001). Insider purchase is more informative because insider sales occur more frequently. If the informativeness of the informed trading signal (purchase or sale) is related to the trading frequency, the higher frequency of insider purchases in Hong Kong suggests that insider sales should be more informative, a hypothesis which is different from that in the US studies.

In Figure 1, the line represents the monthly market return and the columns represent the monthly average of shares purchased (dotted column) and sold (solid column). The market return is volatile in 1994 and becomes stable between 1995 and 1996. During the Asian financial crisis (defined in this study as between October 1997 and October 1998), the market return is the most volatile with a sharp drop in October 1997. It appears that the insider trading activity is more active during the time when the market return is more volatile (in 1994 and between second half of 1997 and first half of 1998).

During the Asian financial crisis, the Hong Kong stock market experienced one of its largest downswings in its history. By the end of October 1997, the Hong Kong Hang Seng Index had accumulated a loss of over 40%. Some studies on informed trading show that there may be abnormal insider trading behaviour during a market crash or other volatile periods (Seyhun 1990; Stephens and Weisbach 1998). The relation between the market returns and aggregate insider trading activity in Hong Kong during the Asian financial crisis is shown in Panel D of Table 1.

The time periods between January 1993 and September 1997 and between November 1998 and December 1999 are defined as the pre-crisis and post-crisis periods respectively. Since October 1997 is the month the Hong Kong stock market suffers the greatest loss, the daily market return and insider trading activity are shown.

There is no great difference in the number of shares purchased and sold during the pre-crisis period. The purchase to sale ratio is 1.22. However, the insider trading activity is particularly active during the month of October 1997. Except on October 21, 1997 where there are more insider sales, the purchase to sale ratio on each day in October is greater than 1.5. This shows that the directors bought more during the crisis period. For the other twelve months (from November 1997 to October 1998) in the crisis period, the average number of shares sold is moderately more than that purchased. However, during the post-crisis period, the number of sold shares is substantially greater than the number of purchased shares (the purchase to sale ratio is 0.25). These statistics show that there is abnormal informed trading behaviour particularly during the period of great market volatility.

Methodology

Chowdhury, Howe and Lin (1993) examine the short-term relation between insider trading and market return with weekly data using vector autoregressive analysis (VAR)[3]. This study uses the vector autoregressive model to examine the causality relation with monthly (one lag), weekly (two lags) and daily (five lags) data. Tests of Granger causality are based on a simple F test in the VAR model. The F-statistics test the null hypothesis that the independent variables do not have Granger-causality relations with the dependent variable. There are two measurements, log

[3] Vector autoregression (VAR) is a time-series model of a set of simultaneous equations in an overfit reduced form to forecast values of more than one variable at a time. Unlike the simultaneous equation model for examining simultaneity among a set of variables, the VAR model employs only past regularities and patterns in historical data as a basis for forecasting. The VAR model requires no *a priori* distinction between endogenous and exogenous variables as it treats all variables as endogenous. Therefore, the vector autoregressive analysis has long been employed for explaining a variable by the past values of the independent variables. This econometric technique is useful in both macroeconomics and microeconomics for finding causality and cointegration relations, for analyzing dynamic relations among several time series values, and for forecasting future values.

value[4] and index value[5], for each of the insider trading variables. Two equation models are used to test the causality relation.

$$MR_t = \alpha_i \sum_{i=1}^{T} MR_{t-i} + \beta_i \sum_{i=1}^{T} Net_{t-i} \quad (1)$$

MR_t is the market return, which is estimated by the Hong Kong Hang Seng Index (HSI) return at time t. MR_{t-i} is the market return at time t-i. Net is the log value of the difference between purchase and sale measures of insider trading activity. T is the number of lags.

$$MR_t = \alpha_i \sum_{i=1}^{T} MR_{t-i} + \delta_i \sum_{i=1}^{T} Purchase_{t-i} + \gamma_i \sum_{i=1}^{T} Sale_{t-i} \quad (2)$$

Purchase is the log value of the purchase measures of insider trading activity. Sale is the log value of the sale measures of insider trading activity.

Time horizon is in terms of monthly, weekly or daily data. Equations (1) and (2) test the causality relation of market return with net, purchase and sale measures respectively.

It is hypothesized that the information-related trading by insiders is in response to many factors including firm-specific, industry-wide or economy-wide events that affect share price return. It is not unusual for the share price of a given firm to deviate from its fundamental value. The misvaluation may be caused by the firm-specific information or economy-wide activity. When there is misvaluation of the share price of a particular firm, the insiders will trade on this special information and will therefore provide information to the market about the fundamental value of

[4] The log method takes the natural logarithm of the net, purchase or sale variable of number of shares, market value, and number of transactions for a given period. Owing to the possibility of skewness in the untransformed data, the various insider trading activity measures are transformed to their log values, as logged variables are more normally distributed. In addition, taking natural logarithms of time-series values helps improve the fit of the linear model in regression analysis.

[5] The index method for net variable of number of shares, market value and number of transactions involves taking the ratio of the difference between purchase and sale to total of purchases and sales for

the firm. Consequently, in aggregate, the insider trading activity should have an impact on the future market return.

Besides examining the predictive power of aggregate insider trading on market return using the vector autoregressive model, a GARCH regression model is also constructed to examine the relative predictive power of the lagged market return, aggregate insider trading activity, and those variables which proxy for fundamental values and economy-wide factors. The model is:

$$MR_t = \alpha_0 + \beta_1 MR_{t-1} + \beta_2 InsiderActivity_{t-1} + \beta_3 Yield_{t-1} + \beta_4 Yield_{t-2} + \beta_5 PE_{t-1} + \beta_6 PE_{t-2} + \beta_7 InterestRate_{t-1} + \beta_8 InterestRate_{t-2} + \beta_8 Export_{t-1} + \beta_{10} Export_{t-2} + \beta_{11} Crisis_t \quad (3)$$

Monthly data are used in the regression due to the nature of the variables (data for some variables are only available at monthly intervals). InsiderActivity is the measure for the intensity of insider trading activity in month t. Intensity is in terms of Nshare (log value of the net number of purchased and sold shares), Pshare (log value of the number of purchased shares), Sshare (log value of the number of sold shares), Nvalue (log value of the net market value of purchased and sold shares), Pvalue (log value of the market value of purchased shares), Svalue (log value of market value of sold shares), Ntransaction (log value of the net number of purchase and sale transactions), Ptransaction (log value of the number of purchase transactions) and Stransaction (log value of the number of sale transactions). Yield is the change in the market dividend yield. PE is the change in the market price-earnings ratio. InterestRate is the change in the average monthly deposit rate. Export is the change in the monthly domestic export index. The change value of the variable is measured by taking the natural logarithm of the ratio of the variable in time t to the variable in time

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a given period. The purchase (sale) index takes the ratio of purchase (sale) to the total of purchases and sales.

t-1. Crisis is a dummy variable which takes the value of 1 if time t does not fall in the thirteen months between October 1, 1997 and October 31, 1998 and 0 otherwise.

According to the findings of previous studies on the relation between aggregate inside transactions and stock market returns based on US data (Seyhun 1988; Seyhun 1992; Chowdhury, Howe and Lin 1993), it is expected that there should be a strong relation between aggregate insider trading activity and future market returns in Hong Kong. The variables which have been documented to have predictive power on market returns are past returns (e.g., Fama and French 1988), dividend yield (e.g., Goetzmann and Jorion 1993), earnings (e.g., Lamont 1998), interest rate (e.g., Lee 1992) and real activity[6] (e.g., Cochrane 1994). It is expected that the market returns should be positively related to Yield, PE and Export and negatively related to InterestRate.

The Asian financial crisis from 1997 through to 1998 caused substantial financial losses for many Asian stock markets. To test if the general market movement behaves differently during the Asian financial crisis and the Hong Kong government intervention periods (a time period between October 1997 and October 1998), a dummy variable (Crisis) is added to the regression model. If there is abnormal market return behaviour during the Asian financial crisis, the dummy variable, Crisis, should be significantly related to the market return.

Time-series studies on macroeconomic and financial data (e.g., exchange rate, inflation rate, interest rate) find evidence of clustering of large and small disturbances (Engle 1982; Engle 1983). This is a form of heteroscedasticty in which the variances

[6] Most studies (e.g., Seyhun 1992) use gross domestic product (GDP) or gross national product (GNP) as proxies of real activity. Gross domestic product (GDP) assesses the total values of production in an area during a specified period. Gross national product (GNP) measures the total dollar value of all final goods and services manufactured for consumption in an area during a specified time period. Therefore, the GNP index indicates the level of economic activity in terms of production output. Initially, GDP and GNP are preferred as the measures of real production activity. However, only quarterly and yearly

of the disturbances are not constant across observations. Engle (1982; 1983) uses the ARCH (autoregressive conditionally heteroscedastic) model to solve the clustering problem of disturbances in time-series analysis[7]. GARCH (generalized ARCH) is a natural extension of ARCH model, which is a more general model with longer lags. A GARCH model is more useful as it allows the variance to evolve over time in a way that is more general than an ARCH model[8]. Therefore, this study uses a GARCH model to examine the relative predictive power of lagged market return, insider trading measures, market dividend yield, market price-earnings ratio, interest rate and export value on general market movement.

IV. Empirical Results

Vector Autoregressive (VAR) Analysis

Table 2 shows the test results of the causality relation between the market return and different measures of insider trading activity. The relative importance of the causality relations between lagged aggregate insider trades and market returns to subsequent market returns are examined. For time-series data to be adequately modeled in an autoregressive analysis, the data series must be stationary (i.e., the mean, variance and autocorrelation function of the data series do not change over time). Therefore, before testing the causality relation of the variables using vector

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data of GDP and GNP are available. Consequently, the domestic export volume is used as a proxy of real activity in the regression model.

[7] The autoregressive conditional heteroskedasticity (ARCH) process of Engle (1982) has been shown to provide a good fit for many financial return time series. The ARCH model allows the conditional variance to change over time as a function of past squared errors. The strength of the ARCH technique is that the conditional means and variances can be estimated jointly using traditional specified models for economic variables. ARCH imposes an autoregressive structure on conditional variance, allowing volatility shocks to persist over time. This persistence captures the propensity of returns of like magnitude to cluster in time and explains the well-documented non-normality and instability of empirical asset return distributions.

[8] Unlike the ARCH model which requires many parameters in order to explain the evolution of return volatility adequately, GARCH (generalized ARCH) adopts a simpler parametric form to express the evolution of return volatility and allows for a much more flexible lag structure. Bollerslev (1986) find

autoregression (VAR), a unit root test is required to assess the stationarity of the variables. The augmented Dickey-Fuller (ADF) test finds that the variables in the equation models of causality relation are stationary, although the results are not reported. The results for the two equation models are presented in the two Panels of Table 2.

For the three time-horizons (monthly, weekly and daily) examined, no significant causality relation is found when the monthly data are used. The causality relation for the two equation models is the most significant in terms of daily data. This finding suggests that the aggregate insider trading activity can be used to predict subsequent market returns. Chowdhury, Howe and Lin (1993) report that the market return in the US is only significantly dependent on the lagged purchase. This study shows that both purchase and sale activities are informative in the sense that they affect market movement.

Seyhun (1988) and Chowdhury, Howe and Lin (1993) show significant relations between market returns and lagged insider trading activity when monthly data and weekly data are used, respectively. The VAR results found in this study demonstrate that there is a significant causality relation between the market return and the lagged insider trading activity particularly over the shorter time horizon (on a daily and weekly basis). The insignificant causality relation between market returns and the lagged monthly insider trades indicates that the aggregate inside transactions are unable to predict future market returns over a longer time horizon. The stronger predictive power of the lagged aggregate insider trading activity on short horizon returns may be due to the more timely reporting and disclosure procedures for securities transactions of directors in Hong Kong. In addition, the market returns are

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that a GARCH model with a smaller number of variables performs as well as or better than an ARCH model with a greater number of variables.

more likely to be influenced by the "latest" insider trades. The data from one month before is no longer relevant as they are superceded by later dealings. The subsequent share dealings negate the impact of month-old data.

There are differences in the disclosure requirements between the US and Hong Kong in terms of time length. The official reporting requirement in the US is ten days after the end of the calendar month in which the transaction occurs while that in Hong Kong is five days from the day the transaction arises. Therefore, the subsequent market returns can respond to the aggregate insider trading activity at a quicker pace in Hong Kong. Table 1 Panel B shows that the directors in Hong Kong are frequent traders. The high frequency of trading and the more efficient disclosure of inside transactions imply that the market reacts to the recent trades. This may be the reason for the weaker causality relation between aggregate insider trading activity and longer horizon market returns (monthly).

While Chowdhury, Howe and Lin (1993) find lagged purchases possess more information content, this study presents a different result that shows that lagged sales exert more impact on market returns. In Panel B, the weekly market return is significantly dependent on the lagged number of purchased shares only. However, Panel C shows a significant relation between weekly market return and all measures of lagged aggregate sales. Chowdhury, Howe and Lin explain the insignificant relation between market return and lagged sales as being due to the higher frequency of sale transactions and the higher likelihood of liquidity reasons for insider sales.

As shown in Table 1 Panel C, the average weekly purchase to sale ratios are 7.47 for the number of shares, 8.84 for the market value and 3.54 for the number of transactions. These statistics indicate that an insider sale occurs less frequently than an insider purchase does. The less frequent incidence of insider sales may imply that

insider sales are not mainly driven by liquidity reasons. Therefore, an insider sale can be an informative signal to project future share price movement. The stronger impact on market returns may be due to the lower frequency of trading and the more effective signal of insiders who sell.

Dynamic Effects

The relations between market return, purchases and sales can also be demonstrated with an impulse response function. An impulse response function is a plot of the period multipliers against the lag length. The path whereby the tested variables return to the equilibrium is the impulse response of the VAR. It shows the speed of reaction of a variable to the shocks in other variables and to the shock in itself. The impulse response functions in Figure 2 track the dynamic effects of a one standard deviation shock in daily market return and measures of purchase and sale on market returns. Figures 2A, 2B and 2C present the responses of insider trading activity in terms of the number of shares, the market value, and the number of transactions, respectively. The response to lagged market return is still the strongest. The market return exhibits the greatest response to the shock on day 1 (the coefficient is close to 0.02). The responses decline on day 2, and after 5 days they are close to zero. Consistent with the results reported in Table 2, the response to purchases is relatively weaker. The response to insider sales occurs on day 3 only (the day 3 coefficient of insider sale is approximately –0.001 for all sale measures).

Variance Decomposition Analysis

The variance decomposition analysis provides information about the relative importance of each innovation in affecting the variables in the VAR model by

splitting the variation of each of the variables into the component variables tested. It shows the magnitude of the variability in the innovations in a variable is accounted for by the variable itself and by the other variables. Table 3 reports the results.

Chowdhury, Howe and Lin (1993) find that approximately 95% of the variance of innovations in market returns is attributed to innovations in market value. In this study, more than 90% of the variation of each variable is explained by its own innovation. The variation in market return is mostly due to the innovation in market return (99%). Less than 1% of the variance in market return is related to insider purchase or insider sale. The variance decomposition analysis shows that the innovation in future market return is mostly affected by its own innovation with minimal impact from insider trading activity.

Several findings in this study are different from those of Chowdhury, Howe and Lin (1993). Chowdhury, Howe and Lin report that insider purchase exerts greater impact on market return innovation. However, based on the results from Table 3, the proportion of insider sale innovation is higher than that of insider purchase in the variance decomposition of market return. While only about 0.07% to 0.16% of the variance of innovations in market returns is attributed to innovations in purchase measures, about 0.34% to 0.59% of the variability in market returns innovations is due to sales innovations. The market return innovation occupies a relatively higher proportion in the variability of insider purchase (approximately 34%) and sale (approximately 43%) in the study of Chowdhury, Howe and Lin. This result shows that the market returns have significant impact on insider purchases and sales. However, the impact of market return innovations on insider purchases and sales, in this study, is at most 7%.

The variance decomposition analysis shows that each of the variables is largely influenced by its own innovations. There is a strong serial dependency in the insider trading measures. Insider purchases (sales) tend to follow insider purchases (sales). This serial dependency is the strongest for the number of share measure. There are less significant relations between the variables and the innovations of the other variables.

Regression Analysis

The regression model examines the relation between the aggregate inside transaction and market return after controlling for factors relating to business condition and fundamental values. In particular, a GARCH model is run[9]. Table 4 presents the results using the log measure of insider trading variables and Appendix 1 exhibits those using the index value of insider trading variables[10].

Seyhun (1988) reports that there is a positive and significant relation between the net aggregate insider trading activity of a given month and the market return during the subsequent two months. Aggregate insider trading activity is found to be the most significant factor in the multiple regression (other variables include past excess returns, dividend yield, term spread and gross national product) to explain future excess return (Seyhun 1992). In this study, no significant relation is found between market return and lagged aggregate insider trading activity except for the market value of sold shares. The negative relation between the aggregate value of

[9] For robustness purposes, the regression analysis is repeated using ordinary least squares. A Ramsey's regression specification error test (RESET) is also run to check if the regression model suffers from specification error. The RESET is used to detect problems of omitted variables, irrelevant variables and incorrect functional forms when conducting regression analysis. The insignificance of the F-statistics of Ramsey's RESET indicates that the regression model is well-specified. Although not reported here, the regression results using the ordinary least square method are qualitatively the same as those reported in Table 4 using the GARCH model.

sold shares and market return suggests that the aggregate insider "Sell" performs its signaling function to predict future market return decline. The insignificance of all the aggregate purchase measures confirms the results of the VAR analysis that the predictability of insider purchase is less effective.

There are two possible explanations for the insignificant associations between most of the aggregate insider trading measures and market movement. The insignificant explanatory power of lagged insider trading activity on market return may suggest that the informed trading by the directors is due to firm-specific rather than market-wide mispricing. Therefore, the insider trading activity in aggregate is not able to predict future market returns. The second explanation may be the use of monthly data in the regression. Seyhun (1988) argues that the information content of aggregate insider trading activity may decline gradually over time. Therefore, the informativeness of the insider trading activity may depend on the speed at which the inside information is disclosed, gathered and used. In Hong Kong, the insider trading information is reported and disclosed within a week. The vector autoregressive analysis in Table 2 shows that the causality relations between the market return and the lagged measures of insider trading activity are only significant when the weekly and daily data are used. Therefore, no significant relation is found in the regression when the monthly data are used. This insignificant finding is somewhat consistent with the inference of Seyhun that the predictability of insider trading activity in aggregate diminishes through time.

According to the findings of previous studies, there should be a significant relation between market returns with past returns (Fama and French 1988), dividend yield (Goetzmann and Jorion 1993), earnings (Lamont 1998) and real activity

[10] Before testing the time-series dependence of the market returns on the various variables, it is important to make sure that each independent variable contains a unit root. Although not reported here,

(Cochrane 1994). However, none of these variables, MR, Yield, PE, InterestRate and Export, representing different aspects of market conditions, are significant in Table 4. In addition, the insignificant t-statistics for Crisis show that there is no difference in the market behaviour during the Asian financial crisis period from the other time period.

The regression results in Table 4 and Appendix 1 show that none of the variables tested is significant in predicting market returns. For the regression analysis, owing to the unavailability of daily or weekly data for some of the variables, monthly data are used. The insignificant findings for the regression analysis may be due to the use of less timely data.

V. Conclusion

This study examines the potential relation between the general market movement and insider trading activity. The sample period is between 1993 and 1999. The autoregressive analysis finds that there is a positive relation between lagged insider trading activity and subsequent market return. However, the predictability of the lagged insider trading activity depends on the time horizon under examination and the direction of the trading strategy. The insider trading activity affects subsequent market return when daily and weekly data are used. The relatively more significant causality relation for short horizon market return may be due to the more timely reporting and disclosure procedures in Hong Kong. This study shows that the lagged insider sale to be more informative than the lagged insider purchase, a finding that contrasts with that in the US (Chowdhury, Howe and Lin 1993). This different result may be due to the less frequent incidence of insider sales in Hong Kong. Although

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the augmented Dickey-Fuller (ADF) unit root test shows that the independent variables are stationary.

there are some interesting findings from the autoregressive analysis, the results of the regression model are constrained by the use of monthly data.

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Table 1

Summary Statistics of Market Returns and Insider Trading Activity (1993 – 1999)

Purchase is the purchase measures of insider trading activity. Sale is the sale measures of insider trading activity. P / S is the ratio of purchase to sale. Market return is measured by the Hong Kong Hang Seng Index (HSI) return.

Panel A : Characteristics of Insider Trading Activity

	Number of Shares ('000,000)				Market Value (HK$ '000,000)				Number of Transactions			
	Purchase	Sale	P / S	Total	Purchase	Sale	P / S	Total	Purchase	Sale	P / S	Total
1993	12,074.19	10,475.97	1.15	22,550.16	21,841.16	33,943.05	0.64	55,784.21	2,415	2,051	1.18	4,466
1994	8,669.76	4,800.24	1.81	13,470.00	23,160.03	11,415.74	2.03	34,575.77	3,425	816	4.20	4,241
1995	2,683.50	1,623.50	1.65	4,306.99	17,276.73	5,526.48	3.13	22,803.20	2,554	992	2.57	3,546
1996	3,095.92	2,465.48	1.26	5,561.40	8,124.57	5,663.68	1.43	13,788.26	3,003	1,505	2.00	4,508
1997	5,066.97	4,813.22	1.05	9,880.18	15,135.84	9,665.39	1.57	24,801.22	4,743	2,204	2.15	6,947
1998	3,420.44	5,099.15	0.67	8,519.59	3,807.37	3,946.74	0.96	7,754.11	4,392	1,218	3.61	5,610
1999	1,985.31	7,997.32	0.25	9,982.63	2,570.04	3,216.54	0.80	5,786.58	2,586	1,771	1.46	4,357
Total	36,996.08	37,274.88	0.99	74,270.96	91,915.75	73,377.61	1.25	165,293.36	23,118	10,557	2.19	33,675
Average	5,285.15	5,324.98	1.12	10,610.14	13,130.82	10,482.52	1.51	23,613.34	3,303	1,508	2.45	4,811

Panel B : Distribution of Time Length between Two Consecutive Trades in terms of the Number of Trading Days

Time Length in terms of Days	Weeks/Months	Number of Transaction	Proportion over the Total Number of Transaction Records	Cumulative Percentage to the Total Transaction Records
1		5,497	29.31%	29.31%
2		2,133	11.37%	40.68%
3		1,601	8.54%	49.21%
4		1,162	6.20%	55.41%
5	(1 week)	957	5.10%	60.51%
10	(2 weeks)	1,985	10.58%	71.09%
15	(3 weeks)	834	4.45%	75.54%
20	(1 month)	510	2.72%	78.26%
40	(2 months)	1,355	7.22%	85.48%
60	(3 months)	740	3.95%	89.43%
80	(4 months)	450	2.40%	91.83%
100	(5 months)	297	1.58%	93.41%
>100		1,236	6.59%	100.00%
Total		18,757		

Table 1 (continued)

Summary Statistics of Market Returns and Insider Trading Activity (1993 – 1999)

Panel C : Summary Statistics of Returns and Insider Trading Activity (Weekly Data)

	Market	Number of Shares ('000,000)				Market Value (HK$'000,000)				Number of Transactions			
	Return	Total	P / S	Purchase	Sale	Total	P / S	Purchase	Sale	Total	P / S	Purchase	Sale
Average	0.0007	203	7.47	101	102	453	8.84	252	202	92	3.54	63	29
Median	0.0008	113		49	43	193		102	62	87		58	23
Standard Deviation	0.0084	326		187	227	1,064		728	714	46		38	21
Maximum	0.0278	3626		2,076	2,654	13,126		12,289	12,050	376		323	150
Minimum	-0.0398	4		1	0	2		1	0	12		6	1

Panel D : Summary Statistics of Returns and Insider Trading Activity during Asian Financial Crisis Period

	Market	Number of Shares ('000,000)			Market Value of Shares (HK$'000,000)		
	Return	Purchase	Sale	P / S Ratio	Purchase	Sale	P / S Ratio
Jan 1993-Sept 1997	0.0009	25.70	21.13	1.22	69.68	59.20	1.18
3 Oct 1997	0.0052	17.60	3.47	5.07	30.92	9.49	3.26
6 Oct 1997	-0.0235	55.08	4.69	11.73	173.11	10.24	16.90
7 Oct 1997	0.0023	9.25	3.98	2.32	29.86	8.35	3.58
8 Oct 1997	0.0019	12.10	5.41	2.24	26.98	6.72	4.02
9 Oct 1997	-0.0388	77.69	1.00	77.69	95.56	2.02	47.25
13 Oct 1997	-0.0141	69.08	0.36	191.88	275.67	0.91	303.51
14 Oct 1997	-0.0169	77.64	2.52	30.84	136.28	5.86	23.27
15 Oct 1997	-0.0332	25.66	0.00		42.66	0.00	
16 Oct 1997	0.0136	36.62	0.48	76.30	48.43	0.99	49.15
17 Oct 1997	0.0025	18.02	2.50	7.21	25.09	2.28	10.98
20 Oct 1997	-0.0474	44.80	4.82	9.30	278.98	3.39	82.38
21 Oct 1997	-0.0448	25.66	208.83	0.12	75.04	124.71	0.60
22 Oct 1997	-0.0637	48.49	11.96	4.06	227.18	11.71	19.40
23 Oct 1997	-0.1099	77.81	41.49	1.88	158.98	21.70	7.33
24 Oct 1997	0.0666	44.41	26.23	1.69	700.96	33.58	20.87
27 Oct 1997	-0.0597	52.10	15.99	3.26	166.63	9.67	17.23
28 Oct 1997	-0.1473	81.18	5.64	14.39	437.30	3.75	116.57
29 Oct 1997	0.1725	22.14	0.97	22.83	165.35	0.99	166.67
30 Oct 1997	-0.0381	67.34	16.59	4.06	92.23	27.88	3.31
31 Oct 1997	0.0249	30.05	2.93	10.26	51.87	4.28	12.13
Nov 1997-Oct 1998	-0.0002	16.18	21.90	0.74	19.37	18.32	1.06
Nov 1998-Dec 1999	0.0018	7.66	30.59	0.25	9.56	12.37	0.77

Figure 1
Monthly Market Return and Aggregate Insider Trading

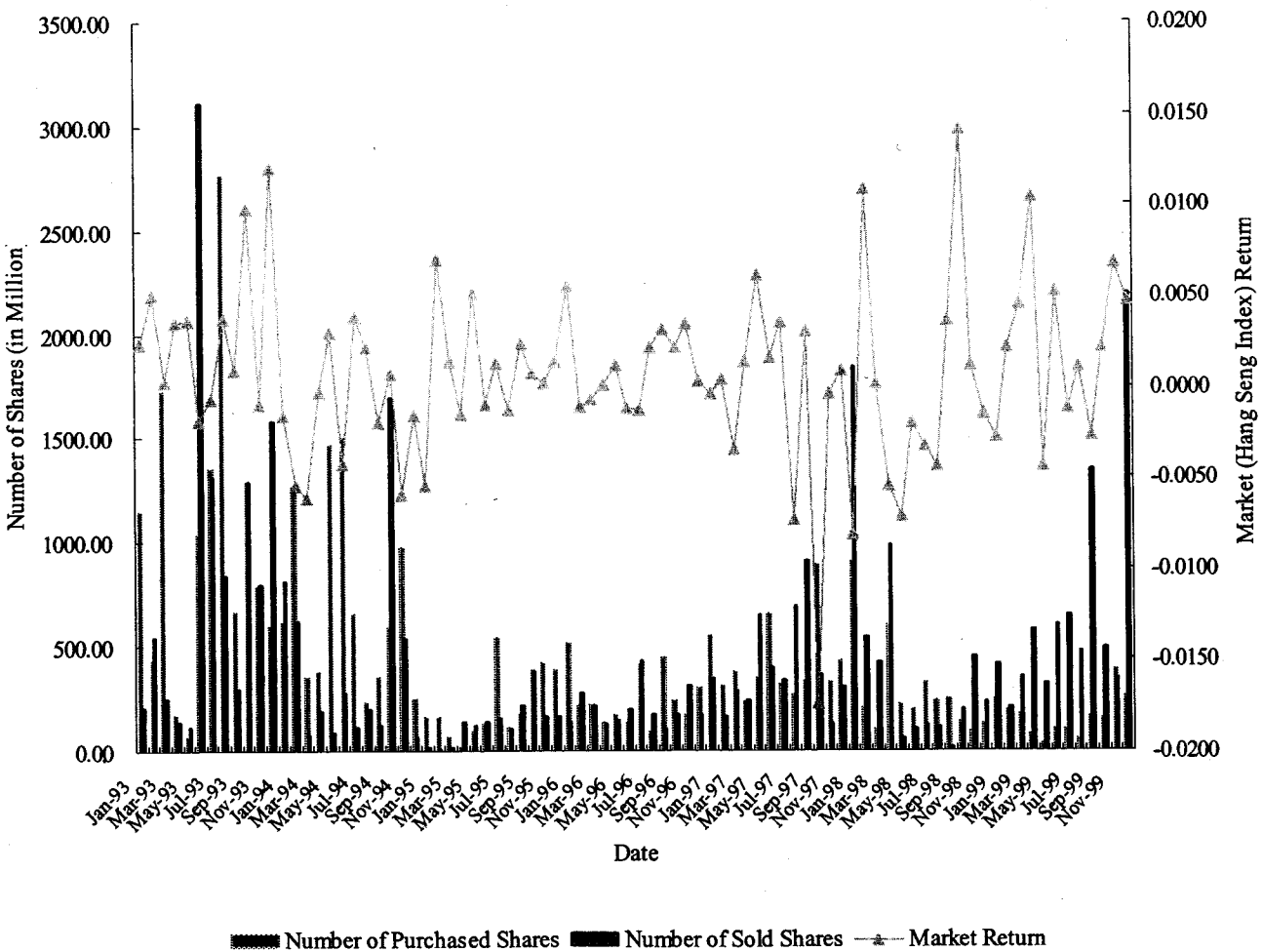

Table 2

Tests of Causality Relations between Market Return and Measures of Insider Trading Activity (Number of Shares, Market Value of Shares and Number of Transactions)

MR is the market return which is estimated by the Hong Kong Hang Seng Index (HSI) return. Net is the log value of the difference between purchase and sale measures of insider trading activity. Purchase is the log value of the purchase measures of insider trading activity. Sale is the log value of the sale measures of insider trading activity. Time horizon is in terms of monthly, weekly or daily data. T is the number of lags. t-statistics are shown in parentheses.

Panel A : Market Return with Net Measures

$$MR_t = \alpha_i \sum_{i=1}^{T} MR_{t-i} + \beta_i \sum_{i=1}^{T} Net_{t-i}$$

Horizon	Lag	Number of Shares	Market Value of Shares	Number of Transactions
			F - statistic	
Month	1	0.6522	1.1152	0.3256
Week	1	1.6194	1.9656*	1.3293
Week	2	1.6311	2.1302*	1.9146
Day	1	1.2337	1.4232	1.5203
Day	2	1.0075	1.2486	1.3146
Day	3	3.5975**	3.8454**	3.7374**
Day	4	4.0257**	4.3834**	4.3008**
Day	5	3.2761**	3.5562**	3.5143**

Table 2 (continued)

Tests of Causality Relations between Market Return and Measures of Insider Trading Activity

(Number of Shares, Market Value of Shares and Number of Transactions)

Panel B : Market Return with Purchase and Sale Measures

$$MR_t = \alpha_i \sum_{i=1}^{I} MR_{t-i} + \delta_i \sum_{i=1}^{I} Purchase_{t-i} + \gamma_i \sum_{i=1}^{I} Sale_{t-i}$$

		Number of Shares				Market Value				Number of Transactions			
Horizon	Lag	MR_{t-i}	$Purchase_{t-i}$	$Sale_{t-i}$	F - statistic	MR_{t-i}	$Purchase_{t-i}$	$Sale_{t-i}$	F - statistic	MR_{t-i}	$Purchase_{t-i}$	$Sale_{t-i}$	F - statistic
Month	1	-0.0281	0.0003	-0.0008	0.7608	-0.0060	0.0002	-0.0007	0.7315	-0.0741	-0.0007	0.0006	0.2354
		(-0.25)	(0.46)	(-1.47)		(-0.05)	(0.36)	(-1.38)		(-0.61)	(-0.59)	(0.61)	
Week	1	0.0794	-0.0005	-0.0004	2.2908*	0.0846	-0.0001	-0.0005	1.9458	0.0870	-0.0004	-0.0009	1.6826
		(1.52)	(-1.25)	(-1.41)		(1.60)	(-0.36)	(-1.55)		(1.61)	(-0.51)	(-1.44)	
Week	2	0.0777	0.0001	0.0003	1.7223	0.0824	-0.0005	0.0006	2.1383*	0.0894	0.0000	0.0022	3.1041**
		(1.48)	(0.12)	(0.87)		(1.54)	(-1.35)	(1.70)		(1.65)	(-0.05)	(3.04)**	
Day	1	0.0326	-0.0003	0.0000	1.1259	0.0318	-0.0004	0.0000	1.3664	0.0340	-0.0007	-0.0003	1.2685
		(1.35)	(-1.15)	(-0.09)		(1.32)	(-1.43)	(0.10)		(1.39)	(-1.14)	(-0.55)	
Day	2	-0.0281	0.0002	-0.0005	1.6842	-0.0287	0.0002	-0.0007	2.3698*	-0.0269	0.0001	-0.0009	1.3211
		(-1.16)	(0.63)	(-2.23)*		(-1.18)	(0.63)	(-2.87)**		(-1.10)	(0.08)	(-1.58)	
Day	3	0.1020	-0.0002	0.0001	3.1981**	0.1062	-0.0001	0.0000	3.7771**	0.1072	-0.0001	-0.0004	3.0463**
		(4.24)**	(-0.52)	(0.23)		(4.40)**	(-0.32)	(0.03)		(4.39)**	(-0.08)	(-0.72)	
Day	4	-0.0767	0.0001	0.0001	3.2840**	-0.0762	0.0002	0.0001	3.7226**	-0.0797	-0.0001	0.0010	3.3446**
		(-3.17)**	(0.26)	(0.52)		(-3.14)**	(0.58)	(0.44)		(-3.25)**	(-0.12)	(1.73)	
Day	5	-0.0158	-0.0002	0.0000	2.6856**	-0.0141	-0.0001	-0.0001	3.0337**	-0.0185	0.0003	0.0004	2.7670**
		(-0.65)	(-0.61)	(-0.10)		(-0.58)	(-0.50)	(-0.22)		(-0.75)	(0.38)	(0.68)	

** significant at the 0.01 level

* significant at the 0.05 level

Figure 2

Impulse Response Functions

Figure 2A Number of Shares

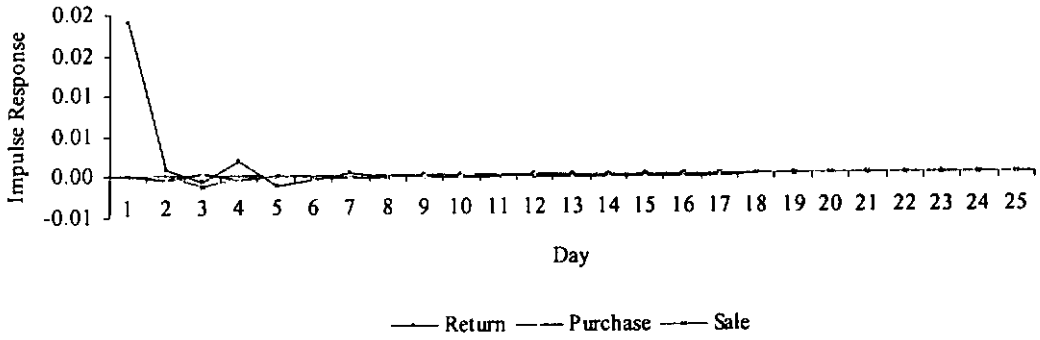

Figure 2B Market Value

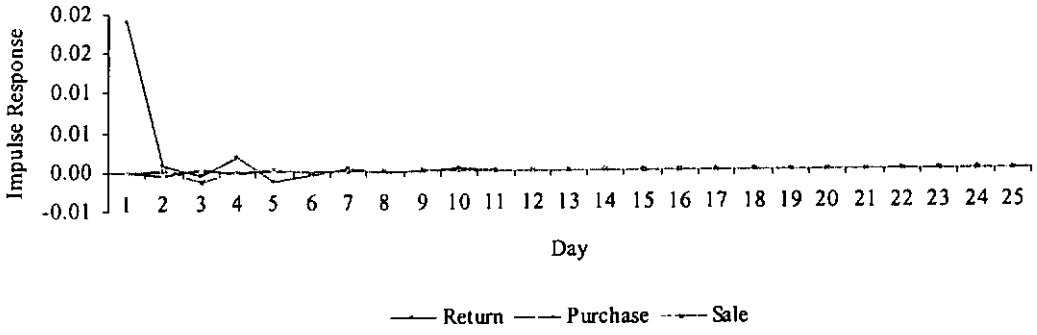

Figure 2C Number of Transactions

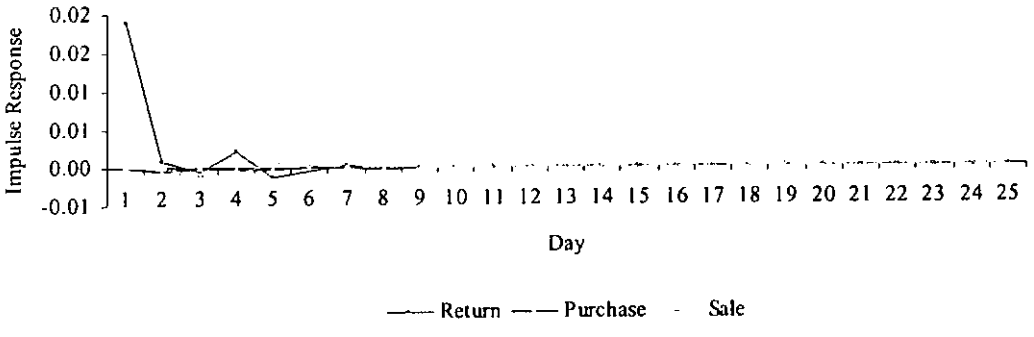

Table 3

Variance Decomposition in Market Returns, Purchases and Sales

Purchase is the purchase measures of insider trading activity. Sale is the sale measures of insider trading activity. Market return is measured by the Hong Kong Hang Seng Index (HSI) return.

		Number of Shares			Market Value of Shares			Number of Transactions		
Variable Explained	Period	Variance Decomposition in Return	Purchase	Sale	Return	Purchase	Sale	Return	Purchase	Sale
Market Return	5	99.5875	0.0700	0.3425	99.3517	0.1060	0.5423	99.4970	0.0725	0.4306
	10	99.5512	0.0956	0.3532	99.2810	0.1402	0.5788	99.4698	0.0920	0.4382
	15	99.5465	0.0994	0.3541	99.2657	0.1506	0.5837	99.4632	0.0977	0.4390
	20	99.5454	0.1004	0.3542	99.2598	0.1551	0.5851	99.4599	0.1008	0.4393
	25	99.5451	0.1006	0.3542	99.2573	0.1571	0.5856	99.4580	0.1024	0.4395
Purchase	5	0.5875	99.0405	0.3721	0.9930	98.7689	0.2381	2.7165	96.9514	0.3321
	10	0.6742	98.7696	0.5562	1.1291	97.5350	1.3360	2.7749	96.4852	0.7399
	15	0.6802	98.7144	0.6055	1.1054	96.9802	1.9144	2.7727	96.2806	0.9467
	20	0.6811	98.6988	0.6201	1.0910	96.7150	2.1940	2.7497	96.1293	1.1211
	25	0.6813	98.6944	0.6243	1.0841	96.5935	2.3224	2.7290	96.0178	1.2532
Sale	5	0.7845	0.7886	98.4268	2.3111	1.6804	96.0085	6.7607	0.9229	92.3164
	10	0.7645	1.3669	97.8686	2.4582	3.1658	94.3760	6.9171	1.4557	91.6272
	15	0.7613	1.5289	97.7098	2.4321	3.9318	93.6361	6.9178	1.7174	91.3649
	20	0.7609	1.5761	97.6631	2.4191	4.2956	93.2852	6.8949	1.8979	91.2072
	25	0.7608	1.5893	97.6499	2.4138	4.4610	93.1253	6.8774	2.0189	91.1037

Table 4

Regression Analysis (GARCH Model using the Log Method Measure)

$$MR_t = \alpha_0 + \beta_1 MR_{t-1} + \beta_2 InsiderActivity_{t-1} + \beta_3 Yield_{t-1} + \beta_4 Yield_{t-2} + \beta_5 PE_{t-1} + \beta_6 PE_{t-2} + \beta_7 InterestRate_{t-1} + \beta_8 InterestRate_{t-2} + \beta_8 Export_{t-1} + \beta_{10} Export_{t-2} + \beta_{11} Crisis_t$$

MR_t is the market return which is measured by the average monthly Hong Kong Hang Seng Index (HSI) return at month t. MR_{t-1} is the market return at month t-1. InsiderActivity is the measure for the intensity of insider trading activity in month t. Intensity is in terms of Nshare (log value of the net number of purchased and sold shares), Pshare (log value of the number of purchased shares), Sshare (log value of the number of sold shares), Nvalue (log value of the net market value of purchased and sold shares), Pvalue (log value of the market value of purchased shares), Svalue (log value of market value of sold shares), Ntransaction (log value of the net number of purchase and sale transactions), Ptransaction (log value of the number of purchase transactions) and Stransaction (log value of the number of sale transactions). Yield is the change in the market dividend yield. PE is the change in the market price-earnings ratio. InterestRate is the change in the average monthly deposit rate. Export is the change in the monthly domestic export index. The change value of the variable is measured by taking the natural logarithm of the ratio of the variable in t to the variable in t-1. Crisis is a dummy variable which takes the value of 1 if time t does not fall in the thirteen months between October 1 1997 and October 31 1998 and 0 otherwise.

	Beta Coefficient (z – statistic)								
Intercept	0.0005	-0.0024	0.0036	0.0010	0.0000	0.0061	-0.0014	-0.0052	-0.0048
	(0.20)	(-0.45)	(1.05)	(0.37)	(-0.01)	(1.97)	(-0.38)	(-0.51)	(-0.66)
MR_{t-1}	-0.1197	-0.0338	-0.2190	-0.0795	-0.0786	-0.2089	-0.0675	-0.0428	-0.0613
	(-0.23)	(-0.07)	(-0.42)	(-0.15)	(-0.15)	(-0.40)	(-0.12)	(-0.08)	(-0.11)
$Nshare_{t-1}$	-0.0002								
	(-0.64)								
$Pshare_{t-1}$		0.0003							
		(0.31)							
$Sshare_{t-1}$			-0.0008						
			(-1.64)						
$Nvalue_{t-1}$				-0.0003					
				(-0.88)					
$Pvalue_{t-1}$					-0.0001				
					(-0.20)				
$Svalue_{t-1}$						-0.0012			
						(-2.96)**			
$Ntransaction_{t-1}$							0.0001		
							(0.08)		
$Ptransaction_{t-1}$								0.0007	
								(0.42)	
$Stransaction_{t-1}$									0.0008
									(0.57)
$Yield_{t-1}$	0.0336	0.0442	0.0290	0.0328	0.0381	0.0271	0.0400	0.0407	0.0459
	(0.79)	(1.02)	(0.73)	(0.74)	(0.86)	(0.69)	(0.92)	(0.95)	(1.04)
$Yield_{t-2}$	-0.0270	-0.0232	-0.0224	-0.0258	-0.0239	-0.0409	-0.0249	-0.0247	-0.0243
	(-0.89)	(-0.76)	(-0.71)	(-0.91)	(-0.74)	(-1.46)	(-0.81)	(-0.77)	(-0.75)
PE_{t-1}	0.0377	0.0438	0.0374	0.0342	0.0389	0.0368	0.0415	0.0417	0.0448
	(1.34)	(1.60)	(1.51)	(1.25)	(1.40)	(1.45)	(1.53)	(1.55)	(1.62)
PE_{t-2}	-0.0218	-0.0180	-0.0164	-0.0213	-0.0195	-0.0326	-0.0202	-0.0202	-0.0208
	(-0.78)	(-0.63)	(-0.54)	(-0.80)	(-0.65)	(-1.24)	(-0.70)	(-0.67)	(-0.70)
Interest $Rate_{t-1}$	0.0037	0.0036	0.0026	0.0032	0.0037	0.0033	0.0037	0.0036	0.0043
	(0.99)	(0.95)	(0.64)	(0.84)	(0.98)	(0.92)	(0.97)	(0.96)	(1.07)
Interest $Rate_{t-2}$	-0.0038	-0.0040	-0.0046	-0.0038	-0.0037	-0.0033	-0.0041	-0.0044	-0.0036
	(-1.23)	(-1.30)	(-1.44)	(-1.25)	(-1.18)	(-1.11)	(-1.10)	(-1.28)	(-1.14)
$Export_{t-1}$	0.0045	0.0045	0.0051	0.0047	0.0043	0.0060	0.0040	0.0042	0.0044
	(0.76)	(0.70)	(0.88)	(0.75)	(0.68)	(1.36)	(0.63)	(0.68)	(0.69)
$Export_{t-2}$	0.0058	0.0067	0.0056	0.0058	0.0056	0.0062	0.0060	0.0069	0.0067
	(0.79)	(0.91)	(0.81)	(0.78)	(0.75)	(1.07)	(0.82)	(0.93)	(0.90)
$Crisis_t$	0.0015	0.0019	0.0017	0.0018	0.0017	0.0016	0.0021	0.0024	0.0020
	(0.86)	(1.21)	(1.10)	(1.22)	(1.10)	(1.04)	(1.33)	(1.46)	(1.19)
Adjusted R^2	-0.0418	-0.0430	-0.0164	-0.0291	-0.0457	-0.0361	-0.0436	-0.0389	-0.0394
F	0.7678	0.7617	0.9067	0.8363	0.7471	0.7984	0.7582	0.7836	0.7805
	(0.70)	(0.71)	(0.56)	(0.63)	(0.72)	(0.67)	(0.71)	(0.68)	(0.69)

** significant at the 0.01 level

* significant at the 0.05 level

Appendix 1

Regression Analysis (GARCH Model using the Index Method Measure)

$$MR_t = \alpha_0 + \beta_1 MR_{t-1} + \beta_2 InsiderActivity_{t-1} + \beta_3 Yield_{t-1} + \beta_4 Yield_{t-2} + \beta_5 PE_{t-1} + \beta_6 PE_{t-2} + \beta_7 InterestRate_{t-1} + \beta_8 InterestRate_{t-2} + \beta_8 Export_{t-1} + \beta_{10} Export_{t-2} + \beta_{11} Crisis_t$$

MR_t is the market return which is measured by the average monthly Hong Kong Hang Seng Index (HSI) return at month t. MR_{t-1} is the market return at month t-1. InsiderActivity is the measure for the intensity of insider trading activity in month t. Intensity is in terms of NshareI (the ratio of the net number of shares to total number of shares), PshareI (the ratio of number of purchased shares to total number of shares), NvalueI (the ratio of the net market value to total market value of purchased and sold shares), PvalueI (the ratio of market value of purchased share to total market value of purchased and sold shares), NtransactionI (the ratio of net number of transactions to total number of transactions) and PtransactionI (the ratio of number of purchased transactions to total number of transactions). Yield is the change in the market dividend yield. PE is the change in the market price-earnings ratio. InterestRate is the change in the average monthly deposit rate. Export is the change in the monthly domestic export index. The change value of the variable is measured by taking the natural logarithm of the ratio of the variable in t to the variable in t-1. Crisis is a dummy variable which takes the value of 1 if time t does not fall in the thirteen months between October 1 1997 and October 31 1998 and 0 otherwise.

	Beta Coefficient (z – statistic)					
Intercept	-0.0017	-0.0029	-0.0003	-0.0029	-0.0005	-0.0001
	(-0.90)	(-1.73)	(-0.18)	(-1.48)	(-0.17)	(-0.03)
MR_{t-1}	-0.4219	-0.2827	-0.1423	-0.2633	-0.3118	-0.1204
	(-0.76)	(-0.55)	(-0.27)	(-0.46)	(-0.54)	(-0.22)
$NshareI_{t-1}$	0.0014					
	(0.66)					
$PshareI_{t-1}$		0.0041				
		(1.67)				
$NvalueI_{t-1}$			-0.0011			
			(-0.34)			
$PvalueI_{t-1}$				0.0042		
				(1.55)		
$NtransactionI_{t-1}$					-0.0009	
					(-0.22)	
$PtransactionI_{t-1}$						-0.0012
						(-0.17)
$Yield_{t-1}$	0.0291	0.0092	0.0133	0.0421	0.0322	0.0348
	(0.70)	(0.24)	(0.31)	(0.97)	(0.76)	(0.81)
$Yield_{t-2}$	-0.0384	-0.0156	-0.0148	-0.0334	-0.0300	-0.0242
	(-1.06)	(-0.43)	(-0.47)	(-1.11)	(-0.87)	(-0.82)
PE_{t-1}	0.0465	0.0214	0.0172	0.0553	0.0431	0.0377
	(1.63)	(0.94)	(0.66)	(2.00)*	(1.59)	(1.41)
PE_{t-2}	-0.0331	-0.0083	-0.0098	-0.0251	-0.0255	-0.0192
	(-0.93)	(-0.23)	(-0.32)	(-0.87)	(-0.77)	(-0.70)
Interest $Rate_{t-1}$	0.0040	0.0012	0.0022	0.0042	0.0045	0.0034
	(1.02)	(0.30)	(0.56)	(1.09)	(1.09)	(0.89)
Interest $Rate_{t-2}$	-0.0027	-0.0042	-0.0040	-0.0037	-0.0024	-0.0035
	(-0.82)	(-1.44)	(-1.28)	(-1.18)	(-0.61)	(-1.06)
$Export_{t-1}$	0.0039	0.0056	0.0049	0.0048	0.0040	0.0045
	(0.82)	(1.05)	(0.86)	(1.03)	(0.73)	(0.74)
$Export_{t-2}$	0.0047	0.0051	0.0051	0.0080	0.0051	0.0061
	(0.70)	(0.81)	(0.69)	(1.23)	(0.70)	(0.82)
$Crisis_t$	0.0022	0.0017	0.0018	0.0013	0.0018	0.0019
	(1.37)	(1.17)	(1.19)	(0.84)	(1.09)	(1.17)
Adjusted R^2	-0.0566	-0.0473	-0.0693	-0.0129	-0.0544	-0.0491
F	0.6900	0.7385	0.6251	0.9262	0.7017	0.7290
	(0.78)	(0.73)	(0.83)	(0.54)	(0.76)	(0.74)

** significant at the 0.01 level
* significant at the 0.05 level

Essay 3

Do Insiders Provide Liquidity ?

Abstract

This study examines the impacts of directors' dealings on firm liquidity. Two different effects are found. In stark contrast to the information asymmetry hypothesis, spread falls and depth widens on insider trading days as compared to non-insider trading days. This result suggests that the increased information disclosure by insiders enhances liquidity. However, the spread and depth measures are positively related and negatively related to how heavily the shares are transacted by informed traders, respectively, i.e., the wider (narrower) the spread (depth), the higher the proportion of informed trading volume to total trading volume. The bid-ask spread decomposition results support the finding that there is enhanced liquidity (reduced adverse selection cost) due to directors' dealings.

Essay 3

Do Insiders Provide Liquidity ?

I. Introduction

Insiders are in possession of confidential information about the current performance and future prospects of their firms. Insider trading performs a signaling function to correct mispricing by improving price accuracy. Therefore, when the insiders trade in the market, the outside market-players believe that the insiders have traded with their price-sensitive information. For this reason, a large volume of insider trading studies have focused on the profit-making motives of insiders. These earlier studies on insider trading find evidence of insider trading profits relative to average market returns (Jaffe 1974; Finnerty 1976; Rozeff and Zaman 1988; Lee and Bishara 1989; Gregory, Matatko, Tonks and Purkis 1994). However, recent insider trading studies report small and insignificant abnormal returns for insiders (Eckbo and Smith 1998; Lakonishok and Lee 2001), and so there is now a question about the importance of profit-making as a dominant motive for insider-trading. This has led researchers to explore other motives for insider trading such as liquidity supply.

The "information model" theory hypothesizes that as the information disparity between insiders and outsiders widens, a share's spread and depth will be adjusted to reflect the changes in the liquidity cost and trading activity. One of the issues in the liquidity literature is whether the informed trading enhances or reduces market liquidity (spread and depth). Major studies (Copeland and Galai 1983; Glosten and Milgrom 1985; Kyle 1985; Easley and O'Hara 1987; Foster and Viswanathan 1990) have shown that greater information asymmetry between informed and uninformed traders leads to wider spreads and narrower depth. However, there are some other studies arguing that increased information disclosure through insider trading or

transparency should enhance liquidity (Admati and Pfleiderer 1991; Pagano and Röell 1996; Harris and Schultz 1997; Brennan and Tamarowski 2000; Cao, Field and Hanka 2003).

The impact of informed trading on liquidity behaviour has been an empirical issue in both the insider trading and liquidity literature. Whether the insiders use their inside information to time the market and whether the market can detect the presence of informed trading by adjusting its liquidity costs has aroused the attention of academics, policy-makers, practitioners and outside investors. The positive and negative changes in market liquidity due to informed trading have informed the debate on whether insider trading should be allowed in order to speed up information transmission or strictly prohibited in order to create an equitable playing field in the securities market. Therefore, it is an interesting empirical question to examine whether informed trading has favourable or unfavourable impacts on market liquidity.

This study uses directors' dealings (informed trading at the individual-level) to explore the impact of informed trading on liquidity in the Hong Kong securities market where insider trading is allowed. No evidence to support the information asymmetry hypothesis is found. Rather, the directors appear to take up the role of making a market for their firms' shares. Spread (absolute spread and relative spread) falls and depth (volume depth, dollar depth, ask depth and bid depth) widens on insider trading days. The increase in market liquidity due to insider trading is still significant even after controlling for volume, price and volatility. There is no difference in the liquidity patterns between informed buy-initiated and sell-initiated orders. The regression results report that there is wider depth on insider trading days.

The bid-ask spread decomposition results show that there is no increase in adverse information cost during insider trading periods. The increased liquidity of

shares caused by the frequent trading of directors appears to initiate a process of price discovery which supports the efficiency argument and hence supports insider trading. Although there is no decrease in market liquidity due to the presence of directors' dealings in the market, the changes in liquidity costs are affected by how heavily the shares are traded by the directors. Spread (depth) increases (decreases) with the trading activity of directors (estimated as the proportion of informed trading volume to total trading volume). These changes in the liquidity patterns support the argument of Holden and Subrahmanyam (1992) that, in equilibrium, market liquidity and informational efficiency depend on the number of insiders.

This essay proceeds as follows. Section II presents the literature review. Data and Methodology are described in Section III. Section IV and Section V report the empirical results and conclude the study, respectively.

II. Literature Review

The information asymmetry model of market microstructure suggests that the extent of information asymmetry between informed and uninformed traders in the market changes the liquidity patterns in the market, and the greater the informational difference, the wider the spread and the narrower the depth (Copeland and Galai 1983; Glosten and Milgrom 1985; Kyle 1985; Easley and O'Hara 1987; Foster and Viswanathan 1990). Insiders possess confidential information about the true value of the firms that the outsiders do not have. When the market suspects the presence of insider trading activity, the spread, depth and adverse selection cost would be adjusted. In order to examine whether market liquidity is affected favourably or unfavourably in the presence of informed trading, many empirical studies have been conducted to test directly the impact of share repurchase and insider trading on the bid-ask spread

and market depth (Barclay and Smith 1988; Cornell and Sirri 1992; Singh, Zaman and Krishnamurti 1994; Wiggins 1994; Franz, Rao and Tripathy 1995; Miller and McConnell 1995; Chung and Charoenwong 1998; Bettis, Cole and Lemmon 2000; Charoenwong and Chung 2000; Brockman and Chung 2001; Cao, Field and Hanka 2003). However, mixed results have been reported.

Barclay and Smith (1988) find that firms making share repurchase announcements have wider relative spreads in the year following the repurchase announcements. In contrast, Singh, Zaman and Krishnamurti (1994) and Miller and McConnell (1995) report no increase in spread surrounding open-market share repurchase announcements.

Chung and Charoenwong (1998) and Charoenwong and Chung (2000) examine the relations between insider trading with spread and depth and find no evidence of significant changes in spread and depth on insider trading days in time-series regression analyses. Cornell and Sirri (1992) use ex-post court records to identify insider trades and find that the liquidity increases when there is active informed trading. Bettis, Cole and Lemmon (2000) find an increase of about two basis points in effective spread during the "allowed" trading period. Cao, Field and Hanka (2003) report only small (on the order of 3% of spread width) and temporary (less than a week) increase in the effective spread.

Brockman and Chung (2001) evaluate the timing ability and resultant corporate liquidity of share repurchases in Hong Kong. Managers use their private information to time the repurchase transactions in the market. There is a significant reduction in market liquidity (spread widens and depth falls) during the repurchasing period. This result implies there is an increase in the adverse selection cost, and it

confirms the information asymmetry hypothesis that the market adjusts liquidity cost in the presence of informed trading.

This study examines the consequent liquidity impacts of directors' dealings in Hong Kong. Share repurchase activity and directors' dealing are two types of informed trading. They are similar in that they are both actions by managers who have inside information. They are dissimilar as a share repurchase is informed trading at the firm-level and directors' dealing is informed trading at the individual-level. According to the information asymmetry hypothesis, the spread (price dimension of liquidity) will increase and the depth (quantity dimension of liquidity) will decrease on insider trading days. As most bid-ask spread and insider trading studies argue that buy-orders should be more informative than sell-orders, higher spread and lower depth should be observed for the purchase transactions of directors (Karpoff 1988; Madhavan and Smidt 1991; Chan and Lakonishok 1993; Lakonishok and Lee 2001). In addition, the estimate of adverse selection cost should be relatively higher during the insider trading period as compared to the non-insider trading period.

III. Data and Methodology

Data

The sample period covers 35 months from May 1996 to April 2000 (excluding the thirteen months between October 1997 and October 1998[1]). This study measures the liquidity patterns of the insider trading firms in Hong Kong. The source of the bid-ask records is from the database maintained by the Research and Planning Division of the Hong Kong Exchange. The bid-ask data files contain intra-day

[1] Since some studies on insider trading and share repurchase (Seyhun 1990; Miller and McConnell 1995; Stephens and Weisbach 1998) suggest that there may be abnormal informed trading behaviour during any market crash period, the thirteen months between October 1997 and October 1998 are

securities information such as ask price, bid price, trading price, trading volume and trading value recorded at 30-second intervals of all the publicly listed firms on the Hong Kong Exchange. The types of securities include ordinary shares, preference shares, warrants, debt securities, and unit trusts. However, only the liquidity patterns of ordinary shares are examined.

The data of insider trading records is extracted from the Inside Trade Asia database marketed by Primark. The directors are required by the Laws of Hong Kong (Chapter 396) to disclose their equity transactions to the public within five business days from the day the equity transactions are conducted. The Hong Kong Exchange reports the transaction information (such as the date of transaction, the names of the director and the firm, the number of shares, the market value of shares, the number of transactions and the price at which the trades are conducted) on the Securities (Disclosure of Interest) Daily Summary and Directors / Chief Executives' Notification Report. The Primark dataset is the electronic version of the information on the Securities (Disclosure of Interest) Daily Summary Report. The database consists of all types of equity transactions (such as open market purchase and sale of shares, options and warrants trading, conversion of bonds and debentures) conducted by the directors of all the listed firms from 1993 onwards. This study examines only the inside transactions which increase and decrease the share-holdings of the directors through open market purchase and sale of shares (Lin and Howe 1990)[2].

The summary statistics of the 701 firms over 721 trading days[3] are shown in Table 1. Panel A reports the differential characteristics of the non-insider trading

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excluded in order to avoid the possible impacts from the Asian financial crisis and the Government intervention on the Hong Kong stock market (Brockman and Chung 2001).

[2] Lin and Howe (1990) mention that an open market transaction is more information-motivated.

[3] There are in total 988 trading days between May 1996 and April 2000. Excluding the 265 days for Asian financial crisis period (from October 1997 to October 1998) and the 2 days (October 14 1996 and December 12 1996) when there is no bid-ask data available, only 721 trading days are left for analysis.

firms (159) and insider trading firms (542). The directors of about 77.32% of the total listed firms engage in inside transactions in the Hong Kong market during the sample period. There is no significant difference between the non-insider and insider trading firms in terms of market capitalization and average daily share price, although both the market capitalization and share price are relatively higher for the firms with no insider trading.

The daily trading volume (insider trading sample firm is 2.38 times the non-insider trading firm sample) and the daily trading value (insider trading firm sample is 1.39 times the non-insider trading firm sample) are higher for the insider trading firms than for the non-insider trading firms. The average daily volume depth, dollar depth, ask depth and bid depth of the insider trading firms are 171,239, HK$ 310,711, HK$ 190,135 and HK$ 120,576 respectively which are 2.04, 1.51, 1.59 and 1.40 times those of the non-insider trading firms respectively. In contrast, the daily share return, the daily return volatility and the two spread measures are lower for insider trading firms. The average absolute and relative bid-ask spread are HK$ 0.0423 (HK$ 0.0687) and HK$ 0.0230 (HK$ 0.0263) for insider trading firms (non-insider trading firms) respectively.

Panel B describes the trading characteristics of the insider trading firms. The directors trade 20,426 million shares with a market value of HK$ 26,300 million in 12,435 transactions (of which 6,378 million shares valued at HK$ 12,106 million are bought in 6,984 trades and 14,048 million shares valued at HK$14,195 million are sold in 5,451 trades) during the sample period. The average proportion of daily informed trading by directors to total trading volume is 30.65%. The insider purchase (sale) takes up 31.10% (25.02%) of the total daily trading volume. There are 425 firms and 427 firms with insider purchases and insider sales, respectively.

Methodology

Measurement of Liquidity Pattern (Spread and Depth)

The liquidity pattern is in terms of two dimensions, spread and depth. The spread represents the price aspect while the depth represents the quantity aspect. Many studies (Lee, Mucklow and Ready 1993; Ahn and Cheung 1999; Brockman and Chung 1999) have shown that the two dimensions of the liquidity pattern exhibit a negative association, that is, a wide (narrow) spread with a small (large) depth. There are two spread measures and four depth measures in this study.

The spread measures the cost of trading. Higher cost of trading is reflected in a wider spread level and hence a decrease in liquidity. The two spread measures are Absolute Spread and Relative Spread[4]. Absolute Spread is the daily average of the absolute dollar difference of the ask and bid prices recorded at 30-second intervals on day t. Relative Spread is the daily average of all relative bid-ask spreads (the dollar difference of the ask and bid prices divided by the bid-ask midpoint) recorded at 30-second intervals on day t.

Depth captures the impacts of the volume and dollar amounts of trading. Larger trading volume and dollar value mean a wider market depth and hence an increase in liquidity. The four depth measures are Volume Depth, Dollar Depth, Ask Depth and Bid Depth. Volume Depth is the sum of the number of shares at the highest bid and the number of shares at the lowest ask recorded at 30-second intervals on day t. Dollar Depth is the sum of the product of the number of shares at the highest bid and the highest bid price and the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Ask

[4] Conrad and Niden (1992) and Miller and McConnell (1995) evaluate the relative strengths of absolute and relative spreads. Relative spread is a better measure in that it represents the transaction cost per dollar traded. However, relative spread is more sensitive to the changes in share price rather than

Depth and Bid Depth are the product of the number of shares at the lowest ask and the lowest ask price and the product of the number of shares at the highest bid and the highest bid price recorded at 30-second intervals on day t respectively.

Measurement of Insider Trading Activity

Glosten and Milgrom (1985) suggest that information asymmetry increases with the proportion of informed traders or with the precision of the private information. In this study, the intensity of the insider trading activity is measured in terms of the number of shares, the market value of shares, the number of transactions and the proportion of informed trading to total trading volume. It is assumed that the informed directors maximize returns by trading a larger quantity of shares to take advantage of their private information.

Measurement of the Determinants of Firm Liquidity

Several trading characteristics, trading volume, share price, return and volatility, have been widely documented in the market microstructure literature as the determinants of market liquidity (Ho and Stoll 1981; Copeland and Galai 1983). Furthermore, the presence of informed trading in the market may exert impacts on these variables which in turn lead to changes in the liquidity patterns. Therefore, these factors are included as control variables in examining the relation between insider trading and market liquidity.

Kyle (1985), Easley and O'Hara (1987), and Glosten and Harris (1988) develop theoretical models that suggest that the adverse selection spread component depends on the order size. The empirical results from many studies (Hasbrouck 1991;

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changes in trading environment. Therefore, both Absolute Spread and Relative Spread are used to examine the price aspect of the liquidity behaviour on insider trading days.

Madhavan and Smidt 1991; Easley, Kiefer and O'Hara 1997; Kempf and Korn 1999) investigate the effects of volume on liquidity and find that larger orders convey more information. In contrast, Harris and Raviv (1993) report increased liquidity with increased volume and Brockman and Chung (1999) find depth to be positively related to volume. Therefore, high trading volume can be associated with high market liquidity. VOLUME is the daily total trading volume.

Spread is a decreasing function of share price and return (Benston and Hagerman 1974; Amihud and Mendelson 1986; Harris 1994). Chung and Charoenwong (1998) find a negative relation between spread and share price and Brockman and Chung (1999) report a positive relation between depth and share price. PRICE is the daily average trading price taken at 30-second intervals. RETURN is estimated by taking the natural log of the contemporaneous average bid-ask to its respective lagged average taken at 30-second intervals.

Many studies find that there is a positive relation between spread and share price volatility (Benston and Hagerman 1974; Stoll 1978; Ho and Stoll 1981; Copeland and Galai 1983; Amihud and Mendelson 1987; McInish and Wood 1992; Chung and Charoenwong 1998). Brockman and Chung (1999) find depth to be negatively related to volatility. VOLATILITY is the standard deviation of the daily continuous return.

Regression Analysis

Two regression models are used to test for the impact of insider trading on liquidity levels. The first model examines if the presence of insider trading activity changes the liquidity pattern of the firm.

$$Liquidity_t = \alpha_0 + \beta_1\ InsiderD_t + \beta_2\ LNVOLUME_t + \beta_3\ LNPRICE_t + \beta_4\ LNVOLATILITY_t \quad (1)$$

$Liquidity_t$ is a variable representing the various liquidity measures, Absolute Spread, Relative Spread, Volume Depth, Dollar Depth, Ask Depth, and Bid Depth, on day t. The various liquidity measures are transformed by taking the natural logarithm[5]. $InsiderD_t$ is a dummy variable which takes the value of 1 if trading day t falls in the insider trading period[6] and 0 otherwise. $LNVOLUME_t$ is the log value of the daily total trading volume on day t. $LNPRICE_t$ is the log value of the daily average trading price on day t. $LNVOLATILITY_t$ is the log value of the standard deviation of daily continuous returns on day t.

The second model evaluates the effect of the informed trading related characteristics on the liquidity level.

$$Liquidity_t = \alpha_0 + \beta_1 LnShare_t + \beta_2 SIGN_t + \beta_3 FSIZE_t + \beta_4 LNVOLUME_t + \beta_5 LNPRICE_t + \beta_6 LNVOLATILITY_t + \beta_7 DTurnover_t \quad (2)$$

$LnShare_t$ is the log value of the number of shares traded by directors on transaction day t. $SIGN_t$ is a dummy variable for the direction of transaction which takes the value of 1 if the trade on day t is a "Buy" (the number of purchased shares exceeds the number of sold shares) and 0 otherwise. $FSIZE_t$ is the size of the firm which is the log value of the market value (closing price times the number of shares outstanding) on day t. $DTurnover_t$ is the ratio of the daily trading volume to the number of outstanding shares on day t.

In regression model (2), instead of using a dummy variable to represent the presence of insider trading, the specific insider trading related characteristics such as the number of shares traded by directors and the trading direction are tested. Since

[5] Owing to the possibility of skewness in the untransformed data, all the liquidity measures are transformed to their log values as logged variables are more normally distributed (Benston and Hagerman 1974). As taking logarithms of zero values yield undefined numbers, a small constant of 0.00001 is added to the liquidity measures which are of zero value (Bamber, Barron and Stober 1997; Brockman and Chung 1998).

there is a possibility that the independent variable (LnShare) is endogenously determined variables, regression model (2) employs the two-stage-least-square regression method for estimation. The presence of informed trading widens the informational difference in the market, hence reducing market liquidity. In contrast, a highly liquid market may enhance informed trading in the market as the directors may disguise their inside transactions by trading in times of high trading volume. Therefore, measures of liquidity and insider trading are jointly dependent or endogenous variables. As the disturbances are correlated with the endogenous variables, the ordinary least squares estimators of the parameters of regression model with independent endogenous variables are inconsistent (i.e., simultaneous equation bias). This study uses the two-stage-least-squares method[7] to estimate the equation using instrumental variables[8] regression.

Adverse Information Cost Component of Bid-Ask Spread

Market microstructure theory proposes that there are three major cost components in the bid-ask spread, inventory-holding cost (e.g., Stoll 1978; Ho and Stoll 1981; Amihud and Mendelson 1982), order-processing cost (e.g., Tinic 1972; Stoll and Whaley 1990), and adverse selection cost (e.g., Copeland and Galai 1983; Glosten and Milgrom 1985). The information asymmetry hypothesis argues that the change in bid-ask spread is affected by the adverse selection cost borne by the market-

[6] Two definitions of insider trading period are used, namely, (1) the 1-day period including the transaction day only; and (2) the 6-day period including the transaction day and 5 disclosure days after the transaction day.

[7] Two-stage-least-squares is a special case of instrumental variables regression which involves two distinct stages. The first stage makes use of an ordinary least squares regression model to estimate the portion of the endogenous and exogenous variables that are attributed to the instruments. The second stage involves estimating the original regression model with all the variables replaced by the fitted values from the first-stage model.

[8] The instrumental variables are used to eliminate the correlation between the independent variables and the disturbances. The two essential characteristics for instruments are that they must be correlated with the explanatory variables in the model and uncorrelated with the disturbances.

maker (Copeland and Galai 1983; Glosten and Milgrom 1985; Kyle 1985; Hasbrouck 1988; Easley and O'Hara 1992; Madhavan 1992; Foster and Viswanathan 1994). The adverse selection component of bid-ask spread is used to compensate for the unexpected loss due to the trading of informed traders in the market. Therefore, the adverse selection problem should be more serious and the adverse selection cost should be higher (wider spread and narrower depth) when there is informed trading in the market (Brockman and Chung 1999; Heflin and Shaw 2001). To further examine the effect of informed trading on market liquidity, this study decomposes the cost components and focuses on the adverse information cost of the bid-ask spread. The adverse selection cost is estimated based on the model of Lin, Sanger and Booth (1995) which takes into account the change in the bid-ask spread average due to the trading direction (buy and sell) and magnitude (trading price and bid-ask average) of the transaction.

$$\Delta M_t = \lambda(z_{t-1}) + \lambda_{insiderD}(z_{t-1} \times InsiderD_{t-1}) \quad (3)$$

ΔM_t is the difference in the log values of the average of ask and bid prices in time interval t and time interval t-1. λ is the adverse selection component of the bid-ask spread. z is the difference between the log values of the trading price and the average of the ask and bid prices. $\lambda_{insiderD}$ measures the incremental adverse selection cost due to informed trading in the insider trading period. InsiderD is a dummy variable which takes the value of 1 if the trading day falls in the insider trading period (transaction day and twenty trading days subsequent the five disclosure days) and 0 if the trading day is a non-insider trading day.

Since there are empirical differences in the informativeness between buyer-initiated trades and seller-initiated trades (Karpoff 1988; Madhavan and Smidt 1991;

Chan and Lakonishok 1993), this study measures the change in the adverse selection component for both informed buy-orders and informed sell-orders.

$$\Delta M_t = \lambda(z_{t-1}) + \lambda_{insiderDB}\,(z_{t-1} \times InsiderDB_{t-1}) \quad (4)$$

$$\Delta M_t = \lambda(z_{t-1}) + \lambda_{insiderDS}\,(z_{t-1} \times InsiderDS_{t-1}) \quad (5)$$

$\lambda_{insiderDB}$ ($\lambda_{insiderDS}$) measures the incremental adverse selection cost due to informed buy-orders (sell-orders) in the insider trading period. InsiderDB (InsiderDS) is a dummy variable which takes the value of 1 if the trading day falls in the insider purchase (sale) period and 0 if the trading day is a non-insider trading day.

IV. Empirical Results

Univariate Analysis

In order to examine the relations between the trading activity, the intensity of insider trading, and the liquidity level, sample comparison tests are performed. These tests examine the difference in the liquidity levels between the insider trading period[9] and the non-insider trading period. According to the information asymmetry hypothesis, higher spread and lower depth is expected during the insider trading period. The non-insider trading period is defined as the twenty days before and twenty days after the insider trading period[10]. Both parametric (two-sample t-test) and non-parametric (Mann-Whitney test) tests for sample differences are conducted. Table 2 reports the results. There are three subsamples, the "Total (including both insider purchase and sale days)" subsample (Panel A and Panel D), the "Buy" (including observations where the number of shares purchased exceeds the number of

[9] Table 2 reports the results using the transaction day only. However, the use of alternative definition of insider trading period (transaction day and 5 disclosure days) does not change the results shown in Table 2 qualitatively.

[10] The sample comparison tests are repeated with three other alternative definitions of non-insider trading periods (± 3-day period, ± 5-day period and ± 10-day period). The results using the three alternative definitions are qualitatively the same as those using the ± 20-day period reported in Table 2.

shares sold) subsample (Panel B and Panel E) and the "Sell" (including observations where the number of shares sold exceeds the number of shares purchased) subsample (Panel C and Panel F).

In each Panel, the sample is divided into four quartiles according to the monthly average of the ratio of daily trading volume to the number of shares outstanding (MTurnover) and the proportion of the number of shares traded by the directors to daily total trading volume (Prop). The lowest percentages of MTurnover and Prop are in the "MTurnover First Quartile" and "Prop First Quartile" respectively. MTurnover and Prop are used to measure the changes in the liquidity behaviour due to the market trading activity and informed trading activity. The actively traded shares should suffer less from information asymmetry. Therefore, there should be a negative relation between liquidity cost and turnover rate (MTurnover). Although there may be less information asymmetry for shares traded actively, there should be more information asymmetry for shares actively traded by informed traders according to the information asymmetry hypothesis. Under this theory, there should be a greater increase in the liquidity level if the shares are heavily traded by informed traders (Prop).

According to the information asymmetry hypothesis, spread (depth) should decrease (increase) with turnover rate. Panels A, B and C report the comparison results of MTurnover quartiles. In all three panels (except for Bid Depth in Panel B), Absolute Spread and Relative Spread (Volume Depth, Dollar Depth, Ask Depth and Bid Depth) are lower (higher) on the inside transaction day than on the non-inside transaction days. The significantly negative (positive) mean differences in spread (depth) measures indicate that there are higher market turnover and liquidity on inside transaction days.

In Panels D, E and F, VOLUME is higher and PRICE is lower on the transaction day. There are two possible explanations for the highly significant VOLUME on the transaction day. First, the directors may choose to trade in times of heavy volume trading days in order to disguise their informed transactions. Second, the increase in trading volume on the transaction day may be due exclusively to the trading activity of directors.

Brockman and Chung (2001) find significantly lower prices during the share repurchase period, suggesting that the repurchasing firms buy shares back when the share prices are low. The finding of a lower value of PRICE on the transaction day in the "Buy" subsample (except for the "Prop Second Quartile") is consistent with the result of Brockman and Chung that the directors buy shares when the prices are low. However, the lower value of PRICE in the "Sell" subsample (except for the "Prop Fourth Quartile") contrasts with the proposition that the directors sell shares when the prices are high.

RETURN and VOLATILITY are higher and lower in the "Full Prop" subsample on the transaction day, respectively. However, depending on the trading direction and trading size of the directors, the changes in RETURN and VOLATILITY on the transaction day and in the non-insider trading period are different.

Brockman and Chung (2001) find mixed results when comparing the various liquidity measures between repurchasing and non-repurchasing periods. During the repurchasing period, there are wider spreads (i.e., lower liquidity) and greater depth (i.e., higher liquidity). This study finds consistent results for the various liquidity measures when comparing the magnitude of the various liquidity measures between the transaction day and non-insider trading period. Spread (Absolute Spread and

Relative Spread) is lower and depth (Volume Depth, Dollar Depth, Ask Depth and Bid Depth) is higher in the "Full Prop" subsample on transaction day. In the Total Sample (Panel D), Absolute Spread (Relative Spread) is 0.0391 (0.0174) on the transaction day versus 0.0453 (0.0179) in the non-insider trading period. All the depth measures, Volume Depth (409 versus 236), Dollar Depth (624 versus 474), Ask Depth (367 versus 290) and Bid Depth (258 versus 184), are higher on the transaction day. Similar results are found for Buy Subsample (Panel E) and Sell Subsample (Panel F). The narrower spread and wider depth, indicating higher market liquidity on the transaction day, do not support the information asymmetry hypothesis. This finding of improved market liquidity due to insider trading is consistent with the conclusion of Cao, Field and Hanka (2003) that liquidity is not impaired by insider trading.

When comparing the spread and depth measures across different Prop quartiles, Relative Spread is the highest and Volume Depth, Dollar Depth and Ask Depth are the lowest in the Prop Fourth Quartile in all three panels (Panels D, E and F). The sample comparison of the various liquidity measures between the transaction day and the non-insider trading period is the least significant in the Prop Fourth Quartile. The "Full Prop" comparison shows that there are significant differences in the liquidity patterns between transaction day and non-insider trading period in a way that informed trading enhances both the price aspect and the quantity aspect of liquidity. However, when the intensity of the informed trading (in terms of the trade size) is examined, relative spread widens and depth falls as the proportion of informed trading to total trading volume increases, hence lowering the market liquidity. These results support the information asymmetry hypothesis and provide evidence that the

change in liquidity behaviour is affected by how heavily the shares are traded by the insiders.

Multivariate Analysis

Market liquidity (spread and depth) is a function of volume, price and volatility. To test whether these confounding factors affect the results of the univariate analysis in Table 2, the relation between liquidity behaviour and insider trading is tested in two multivariate regression models after controlling for volume, price and volatility. t-statistics of the results are adjusted for heteroskedasticity with the Newey and West (1987) procedure.

Regression Model (1)

Regression model (1) examines if the presence of insider trading has an impact on the liquidity patterns. InsiderD differentiates the presence of informed trading in the insider and non-insider trading periods[11]. Table 3 reports the results for the three subsamples (Total, Buy and Sell).

In Table 3, LNVOLUME, LNPRICE and LNVOLATILITY are significant factors determining the liquidity behaviour. Consistent with the findings of previous empirical studies in the market microstructure literature (e.g., Brockman and Chung 1999), LNVOLUME and LNPRICE are positively (negatively[12]) related and LNVOLATILITY is negatively (positively) related to depth (spread).

[11] Table 3 reports the results for using transaction day as the insider trading period and ± 20 days as the non-insider trading period. The analysis of regression model (1) is repeated using both transaction day and five disclosure days as the insider trading period as well as ± 3 days, ± 5 days and ± 10 days as the non-insider trading period. The results are qualitatively the same.

[12] There are opposite signs between Absolute Spread (positive relation) and Relative Spread (negative relation) with LNPRICE. As Relative Spread can be sensitive to changes in both share price and probability of informed trading, these two spread measures may exhibit differences in liquidity behaviour. Brockman and Chung (2001) also find that higher share price is associated with wider absolute spread and narrower relative spread.

The results for directors' dealings in Table 3 show that InsiderD is significant for the depth measures only. However, the signs of relations provide no evidence in support of the information asymmetry hypothesis. Consistent with the findings for the univariate analysis reported in Table 2, there is a positively significant relation between InsiderD and depth. The positive coefficient for InsiderD suggests that the presence of director's dealings in the market, rather than reducing market liquidity, increases the quantity aspect of liquidity. The increase in market depth on the inside transaction day found in this study does not provide support for the asymmetric-information hypothesis. This finding is consistent with that of Cao, Field and Hanka (2003) who find that their measures of market depth improve substantially with insider trading.

The sample comparison result of Prop in Table 2 suggests that the change in liquidity pattern is affected by how heavily the shares are traded by insiders. As the average trade size to total trading volume of share repurchases is 44.48% in the study of Brockman and Chung (2001), which is larger than that of directors' dealing in this study (30.65%), the impact on liquidity behaviour from directors' dealings may not be as significant as that in Brockman and Chung.

The division of the "Total" sample into "Buy" (Panel B) and "Sell" (Panel C) subsamples is done so as to examine the asymmetric changes in bid-side depth and ask-side depth due to informed trading of buy-initiated and sell-initiated orders, respectively. In the examination of the impact of share repurchases on market liquidity, Brockman and Chung (2001) report that the more significant test statistics for the bid-side depth than for the ask-side depth is due to the imbalance of trading activity mainly from share repurchases. However, as shown in Table 3 Panel B, the bid-side depth is not significant in the "Buy" subsample. In Panel C, both ask-side

and bid-side depths are significant in the "Sell" subsample. Therefore, this study finds no significantly asymmetric changes in depth due to differences in informed trading direction.

Regression Model (2)

Regression model (2) evaluates the relation between the insider trading related characteristics and liquidity pattern after controlling for volume, price, and volatility. The results are shown in Table 4. The results in Tables 2 and 3 suggest that the presence of directors' dealings on the transaction day improves market liquidity (narrower spread and wider depth) rather than increasing the information asymmetry in the securities market. When comparing the various liquidity measures across different quartiles, the relative spread (volume depth, dollar depth and ask depth) is the lowest (highest) in the "Prop First Quartile" and the highest (lowest) in the "Prop Fourth Quartile". These trends of increase and decrease indicate that the liquidity patterns change in accordance with the degree of informed trading. Regression model (2) examines the relation between the degree of informed trading and liquidity behaviour in a multivariate setting. In Table 4, LnShare[13] is found to be significant in determining the liquidity levels (both the price and quantity aspects) even after controlling for volume, price and volatility. The spread measures increase and the depth measures decrease with the number of shares traded by the directors, indicating that insider trading reduces market liquidity when the number of shares transacted by the insiders increases.

[13] There are various alternative variables such as the market value, the number of transactions and the proportion of informed trading volume to measure the intensity of insider trading. For robustness purposes, these alternative variables are also tested in regression model (2). LnValue is the log value of the market value of the shares traded by the directors. LnTran is the log value of the number of transactions conducted by the directors. Prop is the proportion of the number of shares traded by directors to the total trading volume. The results are qualitatively the same as those reported in Table 4 when LnShare is used.

Most bid-ask spread studies report that the buy-initiated order is more informative than the sell-initiated order (Karpoff 1988, Madhavan and Smidt 1991; Chan and Lakonishok 1993). Many insider trading studies (Allen and Gorton 1992; Gregory, Matatko and Tonks 1997; Lakonishok and Lee 2001) argue that insider sales may be motivated by different reasons and they suggest that insider purchases are more information-motivated than sales. Therefore, the trading direction (SIGN) is included in regression model (2) to examine if the liquidity cost is positively related to the "buy" transaction. SIGN is not significant in Table 4, suggesting that the changes in the liquidity behaviour are not related to the trading direction of the insiders.

Larger firms exhibit lower spreads due to higher liquidity (Stoll and Whaley 1983; Amihud and Mendelson 1986). Chung and Charoenwong (1998) and Charoenwong and Chung (2000) report negative and positive relations between firm size with spread and depth respectively. Table 4 shows that there are significantly negative and positive relations between firm size and spread and depth, respectively. This finding suggests that there is higher market liquidity (represented by narrower spread and greater depth) for larger firms, which are usually more actively traded in the market.

Turnover rate (DTurnover) is included in regression model (2) to examine if the market trading activity has an impact on the liquidity pattern on the insider transaction day. Heavily traded shares should suffer less from information asymmetry, hence a negative (positive) relation is expected between spread (depth) and DTurnover. DTurnover is only significant with the depth measures in the "Total" sample and "Buy" subsample. Comparing the explanatory powers of LnShare and DTurnover, LnShare appears to have a relatively higher explanatory power in liquidity behaviour than DTurnover. This finding suggests that, although there should

be lower information asymmetry (higher market liquidity) when the shares are heavily traded in the market, market liquidity is, in fact, adversely affected if the shares are heavily traded by informed traders. Trading volume is an influential factor affecting the liquidity pattern but informed trading volume exerts a more dominant impact.

Adverse Information Cost Component of Bid-Ask Spread

Market microstructure theory proposes that the adverse selection cost increases in an informationally asymmetric market with informed trading (Copeland and Galai 1983; Glosten and Milgrom 1985). Regression model (3) examines the decomposition of the bid-ask spreads into adverse selection cost component due to directors' dealings and Table 5 reports the results[14] for the insider trading period defined as the transaction day and twenty trading days subsequent to the five disclosure days[15].

According to the information asymmetry hypothesis, the presence of informed trading should increase the adverse selection cost. It is expected that $\lambda_{insiderD}$ should be positively significant. Brockman and Chung (2001) observe that there is an increase of 7.95% in adverse selection cost during a repurchasing period to make the adverse information cost component of bid-ask spread 20.28%[16]. Cao, Field and Hanka (2003) find a small but insignificant increase in asymmetric information component of spread with increase in insider trading. In Table 5, the coefficient of λ

[14] The decomposition results shown in Table 5 are estimated based on the decomposition approach of Lin, Sanger and Booth (1995). For robustness purposes, this study also employs the decomposition approach used by Weston (2000) which is a modified version of the component estimation technique of Huang and Stoll (1997). The use of this alternative estimation model for adverse selection cost does not qualitatively alter the results reported in Table 5.

[15] The decomposition model is repeated with different definitions of the insider trading period (the transaction day only, transaction day (with or without five disclosure days) and three subsequent days, transaction day (with or without five disclosure days) and five subsequent days, transaction day (with or without five disclosure days) and ten subsequent days and transaction day with five disclosure days and twenty subsequent days. The results using different definitions of insider trading period are not qualitatively different from those reported in Table 5.

is 0.2288 (significant at 0.01 level) which means that the estimated adverse selection cost takes up 22.88% of the bid-ask spread. The coefficients of various versions of $\lambda_{insiderD}$ ("Total" sample, "Buy" subsample and "Sell" subsample) are negative and insignificant. The negative coefficient of $\lambda_{insiderD}$ indicates that the presence of directors' dealings in the insider trading period helps decrease information asymmetry in the market by reducing the adverse selection cost. The decrease in adverse selection cost found in Table 5 is consistent with the findings in Tables 2 and 3 that directors' dealings increase market liquidity, hence providing no evidence in support of the information asymmetry hypothesis.

V. Conclusion

This study addresses whether the presence of informed trading has an unfavourable impact on market liquidity in Hong Kong. The results show that informed trading improves both the price and the quantity aspects of liquidity. Spread goes down and depth goes up on the inside transaction day. The adverse information cost decreases during the insider trading period. These findings suggest that the securities transactions of the directors, rather than widening the informational difference between the insiders and outsiders in the market, mitigate the information asymmetry problem by increasing market liquidity. However, if the insiders become too active and trade heavily in the market, then market liquidity is impaired. Spread and depth are positively and negatively related to the magnitudes of insider trades in the market, respectively.

The increase in market liquidity is more significant in terms of market depth. There are two possible reasons for the higher liquidity. Perhaps one of the

[16] Brockman and Chung (1999) find that the mean full sample estimate of adverse selection cost is 31.15% (420 Hong Kong listed firms from May 1 1996 to August 29 1997).

motivations for directors' dealing is to make a market for the shares in the securities market. Therefore, there may not be any information content for their trades. This motivation shares the same argument of the liquidity increase hypothesis that the firms strategically formulate a corporate policy to enhance liquidity. Diamond and Verrecchia (1991) state that illiquid shares due to high adverse selection cost attract few investors and hence depress share prices. Therefore, directors prefer their firms' shares to be highly liquid. One of the ways to improve liquidity is to conduct trades in the market themselves.

Another explanation for the association between high liquidity and informed trading is that the directors may prefer to be inconspicuous traders to conduct trades in times of heavy volume trading days so as to disguise their inside transactions. On heavy trading days where there are more outside buyers and sellers in the market, it is easier for insiders to hide their trades. Therefore, the days with heavy trading entice the insiders to conduct informed trading and increased informed trading on the transaction days would cause the market liquidity to increase further.

The dissimilarities in the resultant impacts on market liquidity for share repurchases found in Brockman and Chung (2001) and for directors' dealings found in this study may be due to the differences in trading frequency[17] and transaction scale. Directors are frequent traders who conduct transactions on a small scale. In addition, the directors often reverse their trades (buy and sell and buy again). The less frequent transactions (due to more regulatory restrictions) conducted on a larger scale and in one trading direction may make the market believe that a share repurchase is more

[17] There are no restrictions on the directors to conduct securities transactions in the market as long as the directors comply with Chapters 395 (Securities (Insider Dealing) Ordinance) and 396 (Securities (Disclosure of Interests) Ordinance) of the Laws of Hong Kong. However, for firms to conduct share repurchases, an ordinary shareholder resolution (50% majority) must be approved in advance. There is a 10% rule which sets an upper limit on the quantity of repurchases within the yearly mandate and a 25% rule which sets an upper limit on the quantity of repurchases within a calendar month. Therefore, there are more constraints for share repurchase transactions.

informative. Therefore, the resultant liquidity impact due to share repurchase is consistent with information asymmetry hypothesis. In contrast, the high frequency of directors' dealings in the securities market helps mitigate the informational difference between the insiders and outsiders and enhances market liquidity.

In conclusion, this study provides no evidence that insider trading increases the information asymmetry problem in the market. Rather, the presence of insider trading helps improve market liquidity in both the price and quantity dimensions if the insiders do not trade too heavily. Market liquidity is impaired if the proportion of the informed trading to daily trading volume becomes too high. This finding may be used as an argument to support "regulated" insider trading instead of "prohibited" insider trading.

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Table 1

Summary Statistics of the Sample Firms

Absolute Spread is the daily average of the absolute dollar difference of the ask and bid prices recorded at 30-second intervals on day t. Relative Spread is the daily average of all relative bid-ask spread (the dollar difference of the ask and bid prices divided by the bid-ask midpoint) recorded at 30-second intervals on day t. Volume Depth is the sum of the number of shares at the highest bid and the number of shares at the lowest ask recorded at 30-second intervals on day t. Dollar Depth is the sum of the product of the number of shares at the highest bid and the highest bid price and the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Ask Depth is the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Bid Depth is the product of the number of shares at the highest bid and the highest bid price recorded at 30-second intervals on day t. "Total" sample includes both "Buy" and "Sell" subsamples. "Buy" subsample includes observations where there is a net purchase of shares (purchases exceed sales). "Sell" subsample includes observations where there is a net sale of shares (sales exceed purchases).

Panel A : Trading Characteristics of Non-insider Trading and Insider Trading Firms

	Total Sample of Firms	Firms with no Insider Trading	Firms with Insider Trading
Number of Firms	701	159	542
Average Market Capitalization (HK$ '000)	5,580,267	5,797,651	5,516,495
Average Daily Number of Shares Traded	8,058,752	3,896,164	9,279,881
Average Daily Market Value of Shares Traded	15,305,577	11,782,618	16,339,065
Average Daily Share Price	4.4814	4.5554	4.4596
Average Daily Share Return	-0.0016	-0.0024	-0.0013
Average Daily Return Volatility	0.0103	0.0125	0.0097
Average Number of Trading Days	530.35	441.47	556.42
Average Percentage of Trading Days with One or More Shares Traded	94.70%	91.96%	95.51%
Average Absolute Bid-Ask Spread (in 30-second Intervals)	0.0483	0.0687	0.0423
Average Relative Bid-Ask Spread (in 30-second Intervals)	0.0237	0.0263	0.0230
Average Volume Depth (in 30-second Intervals)	151,408	83,810	171,239
Average Dollar Depth (in 30-second Intervals)	286,866	205,584	310,711
Average Ask Depth (in 30-second Intervals)	174,070	119,310	190,135
Average Bid Depth (in 30-second Intervals)	112,796	86,274	120,576

Panel B : Trading Characteristics of Insider Trading Firms

	Buy	Sell	Total
Total Number of Shares Traded by Insiders ('000,000)	6,378	14,048	20,426
Total Market Value of Shares Traded by Insiders (HK$ '000,000)	12,106	14,195	26,300
Total Number of Transactions Traded by Insiders	6,984	5,451	12,435
Total Number of Transaction Records	4,205	3,207	7,412
Average Proportion of Daily Informed Trading to Total Trading Volume	31.10%	25.02%	30.65%
Number of Firms with Insider Trading Days	425	427	
Average Number of Trading Days per Trading Firm	11.61	8.01	
Number of Firms with 1 to 10 Insider Trading Days	294	319	
Number of Firms with 11 to 20 Insider Trading Days	57	66	
Number of Firms with 21 to 30 Insider Trading Days	32	30	
Number of Firms with 31 to 40 Insider Trading Days	15	4	
Number of Firms with 41 to 50 Insider Trading Days	7	5	
Number of Firms with 51 to 60 Insider Trading Days	4	2	
Number of Firms with 61 to 70 Insider Trading Days	7	1	
Number of Firms with 71 to 80 Insider Trading Days	1	0	
Number of Firms with 81 to 90 Insider Trading Days	4	0	
Number of Firms with 91 to 100 Insider Trading Days	1	0	
Number of Firms with more than 100 Insider Trading Days	3	0	

Table 2

Sample Comparison

"Total" sample includes both "Buy" and "Sell" subsamples. "Buy" subsample includes observations where there is a net purchase of shares (purchases exceed sales). "Sell" subsample includes observations where there is a net sale of shares (sales exceed purchases). Non-Insider Trading Period is defined as twenty days before and twenty days after the Insider Trading Period (transaction day and five disclosure days). VOLUME is the daily total trading volume (in thousand). PRICE is the daily average trading price taken at the 30-second intervals. RETURN is estimated by taking the natural log of the contemporaneous average bid-ask to its respective lagged average taken at the 30-second intervals. VOLATILITY is the standard deviation of the daily continuous return. Absolute Spread is the daily average of the absolute dollar difference of the ask and bid prices recorded at 30-second intervals on day t. Relative Spread is the daily average of all relative bid-ask spread (the dollar difference of the ask and bid prices divided by the bid-ask midpoint) recorded at 30-second intervals on day t. Volume Depth is the sum of the number of shares at the highest bid and the number of shares at the lowest ask recorded at 30-second intervals on day t (in thousand). Dollar Depth is the sum of the product of the number of shares at the highest bid and the highest bid price and the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t (in thousand). Ask Depth is the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t (in thousand). Bid Depth is the product of the number of shares at the highest bid and the highest bid price recorded at 30-second intervals on day t (in thousand). MTurnover is the monthly average of the ratio of daily trading volume to number of outstanding shares with the lowest MTurnover percentage in the First Quartile and the highest MTurnover percentage in the Fourth Quartile. Prop is the proportion of the number of shares traded by directors to the total trading volume with the lowest Prop percentage in the First Quartile and the highest Prop percentage in the Fourth Quartile.

Panel A : Total Sample (MTurnover)

	Full MTurnover		MTurnover First Quartile		MTurnover Second Quartile		MTurnover Third Quartile		MTurnover Fourth Quartile	
	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading
	Mean Difference (t – statistics for Mean Difference)									
VOLUME	23902	11785	341	601	1621	1320	4271	3382	58406	26659
	(8.44)^{**b}		(-4.19)^{**b}		(3.73)^{**b}		(4.58)^{**b}		(8.70)^{**b}	
PRICE	5.1753	6.0103	2.5716	3.8486	7.7635	9.6418	8.9600	9.1096	1.7570	2.2800
	(-4.61)^{**b}		(-7.28)^{**b}		(-4.94)^{**b}		(-0.27)		(-7.17)^{**b}	
RETURN	0.0000	-0.0010	0.0002	-0.0047	0.0000	-0.0008	-0.0002	-0.0005	0.0000	-0.0005
	(2.37)^{*b}		(1.72)^{b}		(1.16)		(0.40)^{a}		(1.23)^{b}	
VOLATILITY	0.0072	0.0077	0.0079	0.0137	0.0059	0.0078	0.0082	0.0071	0.0070	0.0066
	(-0.95)^{b}		(-2.86)^{**b}		(-1.98)^{*b}		(0.78)^{a}		(0.52)^{b}	
Absolute Spread	0.0394	0.0458	0.0505	0.0644	0.0559	0.0651	0.0508	0.0545	0.0180	0.0237
	(-7.50)^{**b}		(-5.15)^{**b}		(-5.69)^{**b}		(-1.69)^{b}		(-7.34)^{**b}	
Relative Spread	0.0175	0.0179	0.0264	0.0264	0.0196	0.0196	0.0157	0.0169	0.0149	0.0157
	(-2.39)*		(-0.01)^{b}		(0.09)		(-3.68)^{**b}		(-4.24)**	
Volume Depth	352	217	36	27	78	45	99	85	793	459
	(5.46)^{**b}		(2.76)^{**b}		(3.61)^{**b}		(1.54)^{b}		(5.30)^{**b}	
Dollar Depth	591	465	57	59	532	415	745	605	684	500
	(2.75)^{**b}		(-0.21)^{b}		(1.70)^{b}		(1.02)^{b}		(3.32)^{**b}	
Ask Depth	356	287	41	39	396	272	512	409	318	273
	(1.72)^{b}		(0.22)^{b}		(2.25)^{*b}		(0.80)^{b}		(1.24)^{b}	
Bid Depth	236	178	15	20	136	142	233	196	366	227
	(3.09)^{**b}		(-1.53)		(-0.25)		(0.98)^{a}		(3.71)^{**b}	

Table 2 (continued)

Sample Comparison

Panel B : Buy Subsample (MTurnover)

	Full MTurnover		MTurnover First Quartile		MTurnover Second Quartile		MTurnover Third Quartile		MTurnover Fourth Quartile	
	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading
	Mean Difference (t – statistics for Mean Difference)									
VOLUME	11615	7832	334	616	1587	1301	3631	3434	39071	21624
	(4.03)^{**b}		(-3.56)^{**b}		(2.73)^{**b}		(0.92)^{b}		(5.04)^{**b}	
PRICE	4.8613	5.9325	2.3173	4.0189	6.7432	9.1434	7.1123	7.3709	1.9274	2.5526
	(-4.96)^{**b}		(-8.54)^{**b}		(-5.29)^{**b}		(-0.47)^{b}		(-4.12)^{**b}	
RETURN	-0.0001	-0.0011	0.0002	-0.0023	0.0001	-0.0014	-0.0004	-0.0001	0.0000	-0.0012
	(1.71)		(1.14)		(1.11)		(-1.00)		(1.01)	
VOLATILITY	0.0075	0.0082	0.0080	0.0130	0.0062	0.0085	0.0094	0.0067	0.0063	0.0069
	(-0.79)^{b}		(-2.14)^{*b}		(-1.59)^{b}		(1.33)^{a}		(-0.45)^{b}	
Absolute Spread	0.0402	0.0485	0.0481	0.0668	0.0513	0.0638	0.0432	0.0475	0.0195	0.0268
	(-7.41)^{**b}		(-6.04)^{**b}		(-6.70)^{**b}		(-1.99)^{*b}		(-3.93)^{**b}	
Relative Spread	0.0189	0.0191	0.0269	0.0270	0.0204	0.0211	0.0162	0.0168	0.0153	0.0157
	(-0.61)		(-0.03)^{b}		(-1.20)		(-1.51)^{a}		(-1.45)	
Volume Depth	193	153	36	28	81	45	103	80	522	386
	(2.09)^{*b}		(2.43)^{*b}		(3.07)^{**b}		(2.41)^{*b}		(1.97)^{*b}	
Dollar Depth	449	419	56	63	485	429	529	536	579	468
	(0.85)^{b}		(-0.45)^{b}		(0.78)^{a}		(-0.09)^{a}		(1.40)^{b}	
Ask Depth	297	257	42	45	372	280	356	367	315	231
	(1.43)^{b}		(-0.21)^{b}		(1.46)^{a}		(-0.20)^{a}		(1.63)^{a}	
Bid Depth	153	162	15	18	113	149	174	168	264	237
	(-0.51)		(-1.19)		(-1.51)		(0.18)		(0.54)^{b}	

Panel C : Sell Subsample (MTurnover)

	Full MTurnover		MTurnover First Quartile		MTurnover Second Quartile		MTurnover Third Quartile		MTurnover Fourth Quartile	
	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading
	Mean Difference (t – statistics for Mean Difference)									
VOLUME	41887	15865	378	552	1700	1360	5407	3409	71871	29610
	(8.42)^{**b}		(-1.98)^{*b}		(3.08)^{**b}		(5.17)^{**b}		(7.81)^{**b}	
PRICE	5.5231	6.0737	3.9079	3.4721	10.1218	10.4809	12.0421	11.0001	1.6327	2.1107
	(-1.81)^{b}		(1.07)		(-0.51)		(0.93)		(-6.92)^{**b}	
RETURN	0.0000	-0.0009	-0.0001	-0.0108	0.0000	-0.0001	0.0001	-0.0009	0.0001	-0.0001
	(1.68)^{b}		(1.28)		(1.17)^{a}		(0.80)^{b}		(6.66)^{**b}	
VOLATILITY	0.0067	0.0072	0.0072	0.0152	0.0052	0.0067	0.0060	0.0076	0.0074	0.0063
	(-0.76)^{b}		(-2.02)*		(-1.54)^{b}		(-1.10)		(1.00)^{b}	
Absolute Spread	0.0379	0.0428	0.0643	0.0587	0.0666	0.0671	0.0634	0.0621	0.0169	0.0218
	(-3.79)^{**b}		(0.88)		(-0.15)		(0.30)		(-10.63)^{**b}	
Relative Spread	0.0155	0.0168	0.0234	0.0238	0.0178	0.0172	0.0146	0.0171	0.0147	0.0157
	(-5.06)^{**a}		(-0.26)		(0.80)		(-4.29)^{**b}		(-4.41)**	
Volume Depth	583	283	36	25	71	44	93	93	977	502
	(5.84)^{**b}		(1.37)^{b}		(2.11)^{*b}		(0.05)^{b}		(5.23)^{**b}	
Dollar Depth	783	512	58	48	643	395	1110	675	746	520
	(2.88)^{**b}		(1.01)^{b}		(1.60)^{a}		(1.25)^{b}		(3.08)^{**b}	
Ask Depth	431	317	39	24	451	261	774	451	315	298
	(1.37)^{b}		(2.29)^{*b}		(1.78)^{b}		(0.97)^{b}		(0.35)^{b}	
Bid Depth	352	196	19	24	192	134	336	224	431	222
	(4.29)^{**b}		(-0.63)		(0.95)		(1.28)^{b}		(4.12)^{**b}	

Table 2 (continued)

Sample Comparison

Panel D : Total Sample (Prop)

	Full Prop		Prop First Quartile		Prop Second Quartile		Prop Third Quartile		Prop Fourth Quartile	
	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading
	Mean Difference (t – statistics for Mean Difference)									
VOLUME	27645	13335	70815	26779	21748	11138	11469	6012	6548	4977
	(9.05)^{**b}		(7.67)^{**b}		(5.69)^{**b}		(5.96)^{**b}		(1.60)^{b}	
PRICE	5.1270	5.9511	9.3889	10.2345	5.0390	5.6647	3.4004	3.5389	2.6802	2.8849
	(-4.61)^{**b}		(-1.44)^{b}		(-2.23)^{*b}		(-0.76)		(-1.47)^{b}	
RETURN	0.0000	-0.0010	0.0001	-0.0006	-0.0002	-0.0005	-0.0001	-0.0008	0.0001	-0.0023
	(2.36)^{*b}		(1.19)^{b}		(0.40)^{b}		(1.06)		(1.81)^{b}	
VOLATILITY	0.0071	0.0077	0.0055	0.0053	0.0084	0.0074	0.0074	0.0082	0.0072	0.0108
	(-0.96)^{b}		(0.33)^{b}		(0.69)^{b}		(-0.64)^{b}		(-3.02)^{**b}	
Absolute Spread	0.0391	0.0453	0.0473	0.0526	0.0364	0.0436	0.0338	0.0398	0.0389	0.0429
	(-7.49)^{**b}		(-2.40)^{*b}		(-5.43)^{**b}		(-3.49)^{**a}		(-3.41)**	
Relative Spread	0.0174	0.0179	0.0116	0.0130	0.0152	0.0160	0.0182	0.0196	0.0250	0.0249
	(-2.68)**		(-6.66)^{**b}		(-3.00)**		(-4.10)^{**b}		(0.09)	
Volume Depth	409	236	944	435	332	210	206	113	155	121
	(6.26)^{**b}		(5.64)^{**b}		(2.89)^{**b}		(4.36)^{**b}		(0.91)^{b}	
Dollar Depth	624	474	1619	965	432	397	264	179	182	191
	(3.29)^{**b}		(3.91)^{**b}		(0.78)^{b}		(3.24)^{**b}		(-0.20)^{b}	
Ask Depth	367	290	956	596	246	230	154	103	111	131
	(1.95)^{b}		(2.43)^{*b}		(0.53)^{b}		(3.43)^{**b}		(-0.51)^{b}	
Bid Depth	258	184	664	369	186	167	109	76	72	60
	(3.90)^{**b}		(4.57)^{**b}		(0.67)^{b}		(1.86)^{b}		(0.78)	

Panel E : Buy Subsample (Prop)

	Full Prop		Prop First Quartile		Prop Second Quartile		Prop Third Quartile		Prop Fourth Quartile	
	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading
	Mean Difference (t – statistics for Mean Difference)									
VOLUME	12213	8224	30952	15518	10473	7140	5015	4549	2404	2354
	(4.12)^{**b}		(4.56)^{**b}		(2.18)^{*b}		(0.88)^{b}		(0.17)^{b}	
PRICE	4.8627	5.9261	9.3080	10.7552	4.1961	4.1737	3.5354	3.8154	2.4132	2.9898
	(-4.95)^{**b}		(-2.06)^{*b}		(0.08)^{a}		(-1.08)		(-3.55)^{**b}	
RETURN	-0.0001	-0.0011	0.0000	-0.0011	-0.0005	-0.0001	0.0000	-0.0016	0.0003	-0.0017
	(1.71)		(1.01)		(-1.07)		(1.05)		(1.21)^{b}	
VOLATILITY	0.0075	0.0081	0.0058	0.0054	0.0094	0.0081	0.0072	0.0088	0.0075	0.0117
	(-0.79)^{b}		(0.41)^{b}		(0.58)^{b}		(-0.97)		(-2.06)^{*b}	
Absolute Spread	0.0402	0.0484	0.0485	0.0569	0.0348	0.0391	0.0368	0.0481	0.0405	0.0475
	(-7.40)^{**b}		(-3.19)^{**b}		(-2.87)^{**b}		(-3.74)**		(-4.42)^{**b}	
Relative Spread	0.0189	0.0190	0.0128	0.0138	0.0172	0.0176	0.0191	0.0207	0.0265	0.0268
	(-0.66)		(-2.84)**		(-1.01)		(-3.22)^{**b}		(-0.37)	
Volume Depth	205	159	441	274	185	155	104	86	90	65
	(2.35)^{*b}		(3.28)^{**b}		(0.55)^{b}		(1.90)^{b}		(1.76)^{b}	
Dollar Depth	462	423	1195	956	284	248	242	165	126	105
	(1.06)^{b}		(1.92)^{b}		(0.71)^{b}		(2.52)^{*b}		(1.25)^{b}	
Ask Depth	302	259	788	604	162	126	167	102	90	64
	(1.55)^{b}		(1.82)^{a}		(1.72)^{b}		(3.00)^{**b}		(1.83)^{b}	
Bid Depth	160	165	408	352	122	122	75	63	36	41
	(-0.25)		(1.05)^{b}		(-0.01)^{b}		(0.69)		(-0.55)^{a}	

Table 2 (continued)

Sample Comparison

Panel F : Sell Subsample (Prop)

	Full Prop		Prop First Quartile		Prop Second Quartile		Prop Third Quartile		Prop Fourth Quartile	
	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading	Transaction Day	Non-Insider Trading
	Mean Difference (t – statistics for Mean Difference)									
VOLUME	49327	18484	118860	34594	35508	20128	26446	11226	16540	7242
	(9.13)**[b]		(6.89)**[b]		(4.95)**[b]		(4.86)**[b]		(4.00)**[b]	
PRICE	5.4021	5.9612	8.9093	9.2004	5.8584	7.4330	3.7770	4.1545	3.0622	2.9505
	(-1.89)[b]		(-0.30)[b]		(-2.98)**[b]		(-1.31)[b]		(0.45)[a]	
RETURN	0.0000	-0.0009	0.0001	0.0000	0.0001	-0.0010	0.0000	-0.0001	0.0000	-0.0025
	(1.67)[b]		(7.67)**[b]		(0.77)[b]		(4.79)**[b]		(1.33)	
VOLATILITY	0.0067	0.0072	0.0065	0.0051	0.0059	0.0076	0.0075	0.0076	0.0068	0.0088
	(-0.77)[b]		(1.00)[b]		(-1.28)[b]		(-0.04)[b]		(-2.44)*[a]	
Absolute Spread	0.0372	0.0421	0.0434	0.0484	0.0384	0.0474	0.0324	0.0355	0.0344	0.0368
	(-3.87)**[b]		(-1.34)[b]		(-3.68)**[b]		(-1.97)*[b]		(-1.27)[a]	
Relative Spread	0.0155	0.0168	0.0107	0.0116	0.0132	0.0151	0.0163	0.0177	0.0218	0.0229
	(-5.41)**[a]		(-3.66)**		(-5.08)**		(-2.84)**		(-1.64)	
Volume Depth	693	314	1548	577	492	295	425	199	306	172
	(6.58)**[b]		(4.97)**[b]		(3.67)**[b]		(4.08)**[b]		(1.55)[b]	
Dollar Depth	838	524	1991	966	719	567	324	273	320	265
	(3.41)**[b]		(3.06)**[b]		(1.38)[b]		(1.15)[b]		(0.65)[b]	
Ask Depth	448	320	1056	582	409	339	176	158	151	184
	(1.57)[b]		(1.55)[b]		(0.91)[b]		(0.47)[a]		(-0.49)[b]	
Bid Depth	391	204	935	385	311	228	148	115	169	81
	(5.11)**[b]		(4.36)**[b]		(1.60)[b]		(1.77)[b]		(2.01)*[b]	

[a] The mean difference between "Transaction Day" and "Non-Insider Trading" Days is significant at 0.05 level by Mann-Whitney test.

[b] The mean difference between "Transaction Day" and "Non-Insider Trading" Days is significant at 0.01 level by Mann-Whitney test.

** significant at 0.01 level

* significant at 0.05 level

Table 3

Regression Analysis

$$Liquidity_t = \alpha_0 + \beta_1\ InsiderD_t + \beta_2\ LNVOLUME_t + \beta_3\ LNPRICE_t + \beta_4\ LNVOLATILITY_t$$

$Liquidity_t$ is a variable representing the various liquidity measures, Absolute Spread, Relative Spread, Volume Depth, Dollar Depth, Ask Depth and Bid Depth, on day t. Absolute Spread is the daily average of the absolute dollar difference of the ask and bid prices recorded at 30-second intervals on day t. Relative Spread is the daily average of all relative bid-ask spread (the dollar difference of the ask and bid prices divided by the bid-ask midpoint) recorded at 30-second intervals on day t. Volume Depth is the sum of the number of shares at the highest bid and the number of shares at the lowest ask recorded at 30-second intervals on day t. Dollar Depth is the sum of the product of the number of shares at the highest bid and the highest bid price and the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Ask Depth is the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Bid Depth is the product of the number of shares at the highest bid and the highest bid price recorded at 30-second intervals on day t. The various liquidity measures are transformed by taking natural logarithm. $InsiderD_t$ is a dummy variable which takes the value of 1 if trading day t falls on the transaction day and 0 if trading day t falls on twenty days before and after the insider trading period (transaction day and five disclosure days). $LNVOLUME_t$ is the log value of the daily total trading volume on day t. $LNPRICE_t$ is the log value of the daily average trading price on day t. $LNVOLATILITY_t$ is the log value of the standard deviation of the daily continuous return on day t. "Total" sample includes both "Buy" and "Sell" subsamples. "Buy" subsample includes observations where there is a net purchase of shares (purchases exceed sales). "Sell" subsample includes observations where there is a net sale of shares (sales exceed purchases). t-statistics are adjusted for heteroskedasticity with Newey and West (1987) procedure.

Panel A : Total Sample

	Absolute Spread	Relative Spread	Volume Depth	Dollar Depth	Ask Depth	Bid Depth
	Beta Coefficient (t – statistics)					
Intercept	-1.9763	-2.1525	-8.5353	-8.9353	-11.5441	-13.1710
	(-37.46)	(-40.42)	(-26.12)	(-26.99)	(-33.40)	(-40.13)
InsiderD	0.0078	0.0139	0.5341	0.5388	0.6371	0.5253
	(0.78)	(1.36)	(4.11)**	(4.10)**	(4.24)**	(3.27)**
LNVOLUME	-0.0597	-0.0534	0.9048	0.9142	0.7953	0.7160
	(-55.27)**	(-49.70)**	(91.26)**	(90.08)**	(71.78)**	(51.73)**
LNPRICE	0.7220	-0.2663	0.0913	0.8637	0.6397	0.8661
	(153.77)**	(-55.08)**	(2.28)*	(21.13)**	(13.14)**	(18.93)**
LNVOLATILITY	0.2382	0.2360	-0.1680	-0.2187	-0.4450	-0.1854
	(25.86)**	(25.17)**	(-3.12)**	(-4.04)**	(-8.29)**	(-3.69)**
Adjusted R^2	0.7681	0.5057	0.1804	0.1897	0.1249	0.1060
F	49947.47	15424.77	3319.82	3532.11	2153.83	1789.45
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 3 (continued)

Regression Analysis

$$Liquidity_t = \alpha_0 + \beta_1 InsiderD_t + \beta_2 LNVOLUME_t + \beta_3 LNPRICE_t + \beta_4 LNVOLATILITY_t$$

Panel B : Buy Subsample

	Absolute Spread	Relative Spread	Volume Depth	Dollar Depth	Ask Depth	Bid Depth
	Beta Coefficient (t – statistics)					
Intercept	-2.1907	-2.3744	-7.1014	-7.5345	-9.7971	-11.5787
	(-35.21)	(-38.45)	(-19.03)	(-19.89)	(-25.45)	(-33.27)
InsiderD	0.0175	0.0161	0.4646	0.4837	0.6745	0.0190
	(1.23)	(1.11)	(2.54)*	(2.61)**	(3.32)**	(0.09)
LNVOLUME	-0.0558	-0.0503	0.8015	0.8121	0.6840	0.5735
	(-43.90)**	(-39.43)**	(81.93)**	(80.07)**	(63.41)**	(42.36)**
LNPRICE	0.7047	-0.2837	0.1720	0.9165	0.6976	1.0260
	(112.55)**	(-44.53)**	(3.02)**	(15.63)**	(10.15)**	(16.30)**
LNVOLATILITY	0.2002	0.1949	-0.0680	-0.1232	-0.3179	-0.0963
	(18.46)**	(18.10)**	(-1.10)	(-1.98)*	(-5.23)**	(-1.78)
Adjusted R^2	0.7109	0.4636	0.1643	0.1763	0.1141	0.0962
F	19860.68	6980.98	1588.79	1730.18	1040.91	860.89
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Panel C : Sell Subsample

	Absolute Spread	Relative Spread	Volume Depth	Dollar Depth	Ask Depth	Bid Depth
	Beta Coefficient (t – statistics)					
Intercept	-1.5886	-1.7456	-10.8582	-11.2005	-14.5403	-15.4448
	(-17.26)	(-18.41)	(-18.95)	(-19.19)	(-22.89)	(-25.09)
InsiderD	-0.0200	-0.0051	0.6524	0.6407	0.5850	1.2698
	(-1.62)	(-0.41)	(3.77)**	(3.65)**	(2.71)**	(5.35)**
LNVOLUME	-0.0618	-0.0540	1.0634	1.0712	0.9776	0.9177
	(-32.79)**	(-29.60)**	(49.47)**	(49.33)**	(40.24)**	(30.78)**
LNPRICE	0.7477	-0.2387	0.0659	0.8655	0.6340	0.8010
	(109.03)**	(-33.08)**	(1.29)	(16.54)**	(10.19)**	(12.90)**
LNVOLATILITY	0.3127	0.3176	-0.2642	-0.3081	-0.5909	-0.2145
	(19.11)**	(18.52)**	(-2.81)**	(-3.20)**	(-6.03)**	(-2.31)*
Adjusted R^2	0.8310	0.5692	0.1919	0.1984	0.1345	0.1139
F	34434.12	9250.55	1663.64	1733.62	1089.02	900.88
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

** significant at 0.01 level

* significant at 0.05 level

Table 4

Regression Analysis (Two-stage-least-squares Method)

$$Liquidity_t = \alpha_0 + \beta_1 LnShare_t + \beta_2 SIGN_t + \beta_3 FSIZE_t + \beta_4 LNVOLUME_t$$
$$+ \beta_5 LNPRICE_t + \beta_6 LNVOLATILITY_t + \beta_7 DTurnover_t$$

$Liquidity_t$ is a variable representing the various liquidity measures, Absolute Spread, Relative Spread, Volume Depth, Dollar Depth, Ask Depth and Bid Depth on day t. Absolute Spread is the daily average of the absolute dollar difference of the ask and bid prices recorded at 30-second intervals on day t. Relative Spread is the daily average of all relative bid-ask spread (the dollar difference of the ask and bid prices divided by the bid-ask midpoint) recorded at 30-second intervals on day t. Volume Depth is the sum of the number of shares at the highest bid and the number of shares at the lowest ask recorded at 30-second intervals on day t. Dollar Depth is the sum of the product of the number of shares at the highest bid and the highest bid price and the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Ask Depth is the product of the number of shares at the lowest ask and the lowest ask price recorded at 30-second intervals on day t. Bid Depth is the product of the number of shares at the highest bid and the highest bid price recorded at 30-second intervals on day t. The various liquidity measures are transformed by taking natural logarithm. $LnShare_t$ is the log value of the number of shares traded by the directors on transaction day t. $SIGN_t$ is a dummy variable for the direction of transaction which takes the value of 1 if the trade on day t is a "Buy (the number of purchased shares exceeds the number of sold shares)" and 0 otherwise. $FSIZE_t$ is the size of the firm which is the log value of the market value (closing price times the number of shares outstanding) on day t. $LNVOLUME_t$ is the log value of the daily total trading volume on day t. $LNPRICE_t$ is the log value of the daily average trading price on day t. $LNVOLATILITY_t$ is the log value of the standard deviation of the daily continuous return on day t. $DTurnover_t$ is the ratio of the daily trading volume to the number of outstanding shares on day t. "Total" sample includes both "Buy" and "Sell" subsamples. "Buy" subsample includes observations where there is a net purchase of shares (purchases exceed sales). "Sell" subsample includes observations where there is a net sale of shares (sales exceed purchases). t-statistics are adjusted for heteroskedasticity with Newey and West (1987) procedure.

Panel A : Total Sample

	Absolute Spread	Relative Spread	Volume Depth	Dollar Depth	Ask Depth	Bid Depth
	Beta Coefficient (t – statistics)					
Intercept	0.5593	0.3205	-31.3890	-32.4744	-43.7775	-40.9416
	(3.72)	(2.07)	(-18.07)	(-18.17)	(-21.32)	(-18.78)
LnShare	0.0198	0.0191	-0.2899	-0.3115	-0.2770	-0.5371
	(5.34)**	(4.95)**	(-3.98)**	(-4.18)**	(-3.15)**	(-6.00)**
SIGN	0.0040	-0.0045	-0.0886	-0.0615	0.1249	-0.2031
	(0.28)	(-0.30)	(-0.38)	(-0.26)	(0.45)	(-0.75)
FSIZE	-0.0756	-0.0807	0.8387	0.8720	1.8720	0.2500
	(-6.00)**	(-6.22)**	(5.36)**	(5.46)**	(10.24)**	(1.33)
LNVOLUME	-0.1385	-0.1224	1.6920	1.7223	1.2753	2.6249
	(-18.31)**	(-15.60)**	(16.69)**	(16.67)**	(10.74)**	(25.80)**
LNPRICE	0.7957	-0.1876	-0.6035	0.1839	-0.8945	1.1746
	(56.63)**	(-12.90)**	(-3.49)**	(1.05)	(-4.56)**	(5.91)**
LNVOLATILITY	0.2966	0.2947	-0.1553	-0.1838	-0.3725	0.6234
	(7.97)**	(8.24)**	(-0.88)	(-1.01)	(-1.92)	(4.34)**
DTurnover	0.2620	0.1955	5.9771	5.4860	15.4951	13.9432
	(1.45)	(1.06)	(3.08)**	(2.80)**	(6.14)**	(5.14)**
Adjusted R^2	0.8408	0.5919	0.1560	0.1620	0.1267	0.2136
F	5461.14	1500.74	192.05	200.88	150.99	281.84
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 4 (continued)

Regression Analysis (Two-stage-least-squares Method)

$$Liquidity_t = \alpha_0 + \beta_1 LnShare_t + \beta_2 SIGN_t + \beta_3 FSIZE_t + \beta_4 LNVOLUME_t + \beta_5 LNPRICE_t + \beta_6 LNVOLATILITY_t + \beta_7 DTurnover_t$$

Panel B : Buy Subsample

	Absolute Spread	Relative Spread	Volume Depth	Dollar Depth	Ask Depth	Bid Depth
	Beta Coefficient (t – statistics)					
Intercept	0.5270	0.2032	-33.2732	-34.5342	-42.5812	-42.1422
	(2.41)	(0.90)	(-13.39)	(-13.60)	(-15.40)	(-14.23)
LnShare	0.0219	0.0206	-0.2910	-0.3193	-0.1909	-0.6407
	(4.01)**	(3.61)**	(-2.65)**	(-2.83)**	(-1.54)	(-5.05)**
FSIZE	-0.0865	-0.0894	1.2178	1.2646	2.1064	0.5805
	(-4.64)**	(-4.65)**	(5.50)**	(5.62)**	(8.49)**	(2.30)*
LNVOLUME	-0.1411	-0.1233	1.4133	1.4465	0.9369	2.3458
	(-13.19)**	(-11.01)**	(9.97)**	(10.02)**	(5.79)**	(16.62)**
LNPRICE	0.7855	-0.1992	-1.0077	-0.2538	-1.1877	0.9612
	(38.20)**	(-9.31)**	(-4.24)**	(-1.06)	(-4.56)**	(3.57)**
LNVOLATILITY	0.2536	0.2476	-0.2638	-0.2888	-0.4860	0.5788
	(5.64)**	(5.78)**	(-1.33)	(-1.43)	(-2.34)*	(3.96)**
DTurnover	-0.0417	-0.1060	14.0163	13.1007	27.7499	22.3623
	(-0.11)	(-0.26)	(2.99)**	(2.82)**	(4.38)**	(2.89)**
Adjusted R^2	0.7692	0.5318	0.1079	0.1239	0.1012	0.1727
F	2310.25	788.06	84.79	98.97	78.97	145.64
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Panel C : Sell Subsample

	Absolute Spread	Relative Spread	Volume Depth	Dollar Depth	Ask Depth	Bid Depth
	Beta Coefficient (t – statistics)					
Intercept	0.8647	0.7447	-28.8084	-29.7412	-44.4362	-40.4826
	(4.97)	(4.13)	(-12.17)	(-12.13)	(-14.82)	(-12.98)
LnShare	0.0194	0.0182	-0.2412	-0.2535	-0.2874	-0.4010
	(4.26)**	(3.90)**	(-2.63)**	(-2.73)**	(-2.33)*	(-3.21)**
FSIZE	-0.0455	-0.0504	0.3366	0.3473	1.5410	-0.1480
	(-2.66)**	(-2.91)**	(1.63)	(1.64)	(5.83)**	(-0.53)
LNVOLUME	-0.1259	-0.1125	2.1527	2.1883	1.7904	3.0974
	(-13.59)**	(-11.93)**	(15.49)**	(15.42)**	(10.61)**	(20.37)**
LNPRICE	0.8280	-0.1554	0.1992	1.0314	-0.1924	1.7002
	(55.28)**	(-10.09)**	(0.85)	(4.37)**	(-0.68)	(5.85)**
LNVOLATILITY	0.4680	0.4810	0.3621	0.3199	0.1411	1.0141
	(8.74)**	(8.85)**	(1.21)	(0.96)	(0.34)	(2.61)**
DTurnover	-0.0735	-0.1261	-3.4677	-3.9959	5.0828	2.6964
	(-0.42)	(-0.69)	(-1.65)	(-1.84)	(1.73)	(0.83)
Adjusted R^2	0.9250	0.7291	0.1982	0.1930	0.1489	0.2146
F	6545.81	1428.91	132.15	127.89	93.85	145.99
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

** significant at 0.01 level
* significant at 0.05 level

Table 5

Decomposition of Adverse Information Cost Component

$$\Delta M_t = \lambda(z_{t-1}) + \lambda_{insiderD}(z_{t-1} \times InsiderD_{t-1})$$

$$\Delta M_t = \lambda(z_{t-1}) + \lambda_{insiderDB}(z_{t-1} \times InsiderDB_{t-1})$$

$$\Delta M_t = \lambda(z_{t-1}) + \lambda_{insiderDS}(z_{t-1} \times InsiderDS_{t-1})$$

ΔM_t is the difference in the log values of the average of ask and bid prices in time interval t and time interval t-1. λ is the adverse selection component of bid-ask spread. z is the difference between the log values of the trading price and the average of ask and bid prices. $\lambda_{insiderD}$ measures the incremental adverse selection cost due to informed trading in the insider trading period. InsiderD is a dummy variable which takes the value of 1 if the trading day falls in the insider trading period (transaction day and twenty trading days subsequent the five disclosure days) and 0 if the trading day is a non-insider trading day. $\lambda_{insiderDB}$ measures the incremental adverse selection cost due to informed buy-orders in insider trading period. $\lambda_{insiderDS}$ measures the incremental adverse selection cost due to informed sell-orders in insider trading period. InsiderDB is a dummy variable which takes the value of 1 if the trading day falls in the insider purchase period and 0 if the trading day is a non-insider trading day. InsiderDS is a dummy variable which takes the value of 1 if the trading day falls in the insider sale period and 0 if the trading day is a non-insider trading day. "Total" sample includes both "Buy" and "Sell" subsamples. "Buy" subsample includes observations where there is a net purchase of shares (purchases exceed sales). "Sell" subsample includes observations where there is a net sale of shares (sales exceed purchases).

	Total Sample	Buy Subsample	Sell Subsample
		Coefficient (t – statistics)	
z_{t-1}	0.2288	0.2288	0.2288
	(7.69)**	(7.49)**	(7.71)**
$z_{t-1} \times InsiderD_{t-1}$	-0.0272		
	(-0.34)		
$z_{t-1} \times InsiderDB_{t-1}$		-0.0312	
		(-0.24)	
$z_{t-1} \times InsiderDS_{t-1}$			-0.0250
			(-0.26)

** significant at 0.01 level
* significant at 0.05 level

Essay 4

Double Signals or Single Signal ?

An Investigation of Insider Trading Around Share Repurchases

Abstract

This study examines directors' dealing activity around share repurchasing periods in Hong Kong. There are significant insider trading activities before the share repurchasing period. However, inconsistent with the signaling hypothesis, the directors' purchase activities during the share repurchase period are significantly lower than the expected level while the directors' sale activities are abnormally higher than the expected level. A share repurchase is a stronger signal than a director purchase in conveying undervaluation. This study finds no evidence that information signaling is a dominating factor driving the share repurchase decision.

Essay 4

Double Signals or Single Signal ?

An Investigation of Insider Trading Around Share Repurchases

I. Introduction

The presence of information asymmetry in financial markets has given rise to voluminous research studies that investigate different signaling devices conducted by insiders. It is an empirical question as to whether insiders use their informational advantage to time their trading and to signal mispricing. Both share repurchases and insider trading are related to and may be motivated by the level of information asymmetry between firms and their directors and the outside investors.

The presence of mispricing in an informationally asymmetric market can be examined by using the concurrent signals conveyed by the firms and the directors through their securities transactions in the market. This study examines insider trading activity around the repurchasing period and uses the simultaneous signal of share repurchase and insider trading to investigate whether the signaling hypothesis is a dominating factor driving share repurchases.

There are many theories explaining the motive and pricing behaviour of share repurchases. While most studies test and compare two or three motives of share repurchase, Dittmar (2000) examines six share repurchase hypotheses using data from the US. Dittmar finds information signaling to be the major motive throughout the whole sample period while other motives are valid in sub-periods. The examination of the two trading signals, share repurchase, and directors' dealings, conducted by the firms and the directors, provides evidence on their relative pricing effects (i.e., the magnitude of market reaction) and the credibility of the undervaluation message.

Previous studies on share repurchases provide results based on the US market setting. The recent implementation of regulations allowing share repurchases in other markets provides opportunities for research studies under different market settings such as Australia, the UK, and Canada (Harris and Ramsay 1995; Rees 1996; Ikenberry, Lakonishok and Vermaelen 2000). The event day for examination is usually the share repurchase announcement date. In Hong Kong, there is no regulatory rule for the firms to make a mandatory repurchase announcement to the public before they formally conduct their repurchase transactions as long as the repurchase decision is already approved through an ordinary shareholder resolution[1]. Ikenberry, Lakonishok and Vermaelen state that the completion rate (the number of shares actually purchased) may reflect the motives for repurchases as well as the share price reaction to repurchases. The market appears to discount the information in repurchase announcements. This study uses the actual repurchase transaction as the event date to measure the share price reaction to the share repurchase. Therefore, the possibility of a mismatch in the percentage of shares targeted in the repurchase announcements and that subsequently acquired in actual repurchases is eliminated[2]. In addition, the timing ability of the managers to buy undervalued shares can be evaluated only if the actual transaction date is precisely identified.

Although the repurchasing firms are not required to make repurchase announcements, they are requested to report their repurchase transactions (the number of shares repurchased and the price at which the shares are repurchased) to the Hong

[1] In Hong Kong, the repurchasing firms have to comply with the Code on Share Repurchase and Chapter 10 (Equity Securities: Restrictions on Purchase and Subscription) of Exchange Listing Rules when they buy-back their shares. Rule 10.06 (1) (a) (iii) of the Listing Rules states that the shareholders of the repurchasing firms have to approve the repurchase decision (a general mandate) by way of an ordinary resolution at a General Meeting.

[2] Stephens and Weisbach (1998) report that only about 74% to 82% of the shares targeted in the repurchase announcement are subsequently acquired in the three years after the repurchase announcement. Ikenberry, Lakonishok and Vermaelen (2000) find 22.3% of firms making repurchase

Kong Exchange on the following day. The mandatory disclosure requirement on a daily basis allows the examination of the market reaction to share repurchases in a more effective way. Share repurchase activity in Hong Kong is not a single-day event. There are many cases where the repurchasing firms buy their shares over a time period (as long as the total quantity of shares repurchased does not exceed the 10% rule which sets an upper limit on the quantity of repurchases within the yearly mandate). The motives for share repurchase activity and the characteristics of repurchasing firms may lead to differences in trading frequency. These differences in the market setting, announcement and disclosure requirements and the high frequency of share repurchase transactions within short time periods may cause the market to behave in a different way from the US studies documented in the literature.

The intensive repurchase transactions conducted within a time period create clustering problems for event studies. To minimize the problems of event clustering on return measurement, this study employs the control firm approach to estimate both the short-term and long-term share price performance of the repurchasing firms. In addition to examining the market reaction of the repurchasing firms with insider trading activity, based upon the methodology of Stephens and Weisbach (1998) and Dittmar (2000), this study also uses a Tobit model to determine the motives for share repurchase decisions in Hong Kong. Three hypotheses, excess cash, information signaling, and leverage, are tested. Dittmar uses the market-to-book ratio and historical return as proxies for undervaluation and firm size as a proxy for information asymmetry. Various measures of insider trading activity are included in the models to examine the information signaling hypothesis of the "Buy" and "Sell" decisions of the firms and their directors.

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announcements do not repurchase any shares within 12 months and the average completion rate for Canadian repurchases is 28.6%.

Between 1993 and 1999, there are 8,295 share repurchase transactions in Hong Kong. Directors' trading activity is found before, during and after the time when the firms conduct their share repurchase activity. However, purchases are not the exclusive trading strategies of directors that accompany share repurchase transactions during the repurchasing period. The event study results show that share repurchases perform a correctional signal of undervaluation. However, the presence of directors' trading signals around the repurchasing period complicates the market responses for share repurchases. The market appears to discount the undervaluation message of the repurchase signal when it is accompanied by directors' purchases. However, the "Sell" signal is more effective in conveying the overvaluation message. The Tobit regression model fails to detect any dominant factor that motivates the share repurchase decision. In the model, only firm size is significant.

This essay proceeds as follows. The literature review and the hypotheses of the study are presented in Section II. Section III describes the data and methodology. The empirical results and conclusion are reported in Section IV and Section V, respectively.

II. Literature Review and Hypothesis Development

The share repurchase phenomenon has been widely explored in the finance literature. There are a number of theories explaining the motives and price behaviour of repurchasing firms. In the literature, the share repurchase event has been tested for the signaling hypothesis (Vermaelen 1981; Ikenberry, Lakonishok and Vermaelen 1995), the leverage hypothesis (Masulis 1980; Pugh and Jahera 1990), the wealth transfer hypothesis (Dann 1981, Wansley and Fayez 1986), the personal taxation hypothesis (Masulis 1980), the free cash flow hypothesis (Denis, Denis and Sarin

1994; Jagannathan, Stephens and Weisbach 2000), the anti-takeover mechanism (Bagnoli, Gordon and Lipman 1989; Denis 1990; Mikkelson and Ruback 1991; Bagwell 1991) and earnings per share growth hypothesis (Dann, Masulis and Mayers 1991; Hertzel and Jain 1991; Bartov 1991).

There are also many studies (Howe, He and Kao 1992; Perfect, Petersen and Petersen 1995; Nohel and Tarhan 1998; Dittmar 2000) conducted to distinguish among the different hypotheses as explanations of the market reaction in order to find out the most appropriate theory that best explains share repurchases. Among the many theories explaining the motive and price behaviour for share repurchasing firms, the signaling hypothesis holds centre-stage. The signaling hypothesis argues that a share repurchase is caused by the informational difference about the true value of the firms' shares between the market and the firms. Owing to the informational asymmetry, insiders have better private information about the present mispricing and future prospects of their firms' shares which is not available to the outsiders[3]. Firms are more likely to buy their shares back when they perceive their shares are undervalued by the market. The repurchase action therefore represents a correctional signal for market misvaluation. Many studies (Vermaelen 1981; Comment and Jarrell 1991; Ikenberry, Lakonishok and Vermaelen 1995; Liu and Ziebart 1997; Stephens and Weisbach 1998) examine the share price reaction of share repurchase announcements and find positive returns around them.

In the insider trading literature, many studies have been conducted that examine the insider trading activities around specific corporate announcements[4].

[3] In a survey research of 140 financial officers of the US firms conducted by Wansley, Lane and Sarker (1989) about their opinions on the possible explanations for share repurchase, the summary results state that the managers use share repurchases to signal their confidence in the present and future values of their shares.

[4] Examples of these studies on corporate announcements include dividend payouts (John and Lang 1991); mergers and acquisitions (Meulbroek 1992); rights issues (Kahle 2000); corporate bankruptcy

Most of the findings show that insider trading activity increases around a financial event. According to the information signaling hypothesis, management of the firms may trade in the market to perform a signaling function. An insider purchase (sale) is a signal of undervaluation (overvaluation) of their firms' shares. Some empirical studies on insider trading (Seyhun 1986; Rozeff and Zaman 1988; Lin and Howe 1990; Jeng, Metrick and Zeckhauser 1999) also report positively significant abnormal returns for insiders. All these studies not only provide evidence that insiders have timing ability to disclose private information to the market, but also demonstrate a "regular" trading pattern that insiders usually buy (sell) before good (bad) news and when the share prices are low (high), thus causing significant share price increase (decrease).

As both share repurchase and insider trading activities can be motivated by information signaling, some US studies examine the insider trading activity around the share repurchase announcement to evaluate the signaling function performed by the firms (through share repurchase) and the insiders (through directors' dealing). Lee, Mikkelson and Partch (1992) study the intensity of managerial trading around the time when their firms announce a repurchase of their firms' shares by tender offer in the sample period from 1977 to 1988. They find an increase in managerial buying and / or a decrease in managerial selling around the share repurchase offer. Raad and Wu (1995) test specifically the share price returns of insider trading activity around an open market share repurchase announcement. They report that there is significant market reaction for the share repurchase cases with insider trading activity occurring one month before the announcement. The insider net buying activity generates larger and more significant abnormal returns for repurchasing firms.

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petitions (Seyhun and Bradley 1997); firms' listing and delisting (Lamba and Khan 1999) and analysts' earnings forecast revisions (Sivakumar and Vijayakumar 2001).

Therefore, if informed trading (share repurchase and directors' dealing) is motivated by signaling purpose, share repurchase should be accompanied by directors' purchases rather than directors' sales. It is expected that the intensity of directors' buying activity should be significantly greater than the intensity of selling activity around the repurchasing period. Furthermore, the market should reflect a stronger signal of share undervaluation conveyed by the joint effect of the purchases of the firms and the directors. Therefore, it is hypothesized that those share repurchase cases that are accompanied by directors' purchases should result in a more favourable market reaction than the share repurchase cases without inside transactions, which, in turn, should cause a more positive market reaction than the share repurchase cases paired with directors' sales.

As share repurchases can be motivated by many motives besides information signaling, many empirical studies on share repurchase investigate the different reasons (e.g., free cash flow, market for corporate control, and optimal leverage) for share repurchase. Dittmar (2000) argues that the share repurchase studies focusing on only few motives may not provide a complete explanatory picture of share repurchases. Dittmar investigates six share repurchase hypotheses (excess cash distribution, undervaluation, capital structure adjustment, management compensation, takeover defense, and firm size) in a Tobit model to examine if there is a dominating motive and how these different motives may interrelate. Based upon the Tobit regression model of Stephens and Weisbach (1998) and Dittmar, this study includes an additional information signaling variable (insider trading activity) to explore the signaling function performed by the firms and the directors in Hong Kong.

III. Data and Methodology

Data

The study covers a 7-year period from 1993 to 1999. The data for share repurchase and insider trading transactions are extracted from the databases of the Company Buy-backs and Directors' Dealings respectively of the Inside Trade Asia Database of Primark. The share price returns and accounting data are retrieved from the Company Returns file and Financial Statements file respectively of the PACAP database.

The Primark database maintains an electronic record of share transactions of directors and share repurchases from 1993 onwards. The sources of data for these two data sets are the Share Repurchase Report and Directors' / Chief Executives' Notification Report which are components of the Securities (Disclosure of Interest) Daily Summary issued by the Hong Kong Exchange. The repurchasing firms are obliged by the Listing Rules of the Hong Kong Exchange to disclose their repurchase transactions to the Hong Kong Exchange on the next trading day. The Laws of Hong Kong (Chapter 396) require directors to report to the Hong Kong Exchange on their securities transactions within five days from the day they make the transactions.

Table 1 shows the summary statistics of the share repurchase activity in Hong Kong between 1993 and 1999. As presented in Panel A, over the seven years, there are 264 firms purchasing 4,728 million of shares with a value of HK$ 28,336 million in 8,295 transactions. On average, there are about 31.42 transactions per repurchasing firm. Panel A also shows the percentage and cumulative percentage of repurchased shares to outstanding shares. The percentage and cumulative percentage of repurchased shares report the average proportion of outstanding shares that are bought-back per repurchase transaction and per repurchase programme respectively.

Through the seven years, on average, about 1% of outstanding shares are bought-back each year[5]. Panel B of Table 1 shows that the frequency of share repurchase transactions in Hong Kong is high. More than half (57.76%) of the total share repurchase transactions occur one day after a previous transaction or one day before a subsequent transaction.

The purchases and sales by directors of repurchasing firms for the six months before and six months after the repurchasing month are reported in Panel C of Table 1. There are three measures, the number of shares, the market value, and the number of transactions. For each of the measures, there are three variables, "Buy (a net purchase of shares)", "Sell (a net sale of shares)" and "Net (the difference between purchase and sale of shares[6])". Only those inside transactions which increase and decrease the share-holdings of the insiders (directors) through the open market purchase and sale of shares are included[7]. For the 6-month period before the repurchasing month (m = 0), there are comparatively more insider purchases than insider sales. The average ratios of "Buy" to "Sell" for the number of shares, the market value and the number of transactions are 2.27, 3.25 and 4.94 respectively. These statistics indicate that the intensity of insider purchases is higher relative to insider sales around the repurchasing period[8].

[5] Stephens and Weisbach (1998) report that the average announced size of an open-market repurchase programme is about 7% of the firm's total shares outstanding on the announcement date in their sample period between 1981 and 1990.

[6] A positive (negative) sign for the "Net" indicates there is a higher (lower) value for the "Buy" than for the "Sell".

[7] The exclusion of other inside transaction types (e.g., exercising options and warrants, conversion of bonds and debentures) is consistent with most of the US studies (e.g., Lin and Howe 1990) on insider trading.

[8] Besides using the number of shares, the market value and the number of transactions as measures of trading activity, two alternative measures, trading volume in percentage of shares outstanding and trading value in percentage of firm market value, are also computed. They are reported in Appendix 1.

Methodology

Measurement of Abnormal Insider Trading Volume

This study focuses on the issue of whether insiders make use of their inside information about the repurchase decision of the firms to also trade in the market for their own personal accounts. Therefore, the intensity of the insider trading activity around the repurchasing period is examined. The prior-period comparison method is used to measure the abnormal insider trading (Gombola, Lee and Liu 1997). The prior period used as a comparison is the 6-month period from m = -12 to m = -7 before the repurchasing month (m = 0).

The average trading measures (number of shares, market value and number of transactions) computed during the comparison period ($-12 \leq m \leq -7$) is used as the expected trading measure when benchmarking with the actual insider trading measures during the seven months of the examination period ($-6 \leq m \leq 0$). Therefore, the abnormal trading measure is the difference between the actual level and expected level of each of the trading measures. The method of Brown and Warner (1985) is used to test the significance of the intensity of the insider trading.

Measurement of Abnormal Share Price Performance

In order to examine if the share repurchase decision of a firm is a signal of undervaluation to the market, the share price performance around the repurchasing period should be examined. The control firm approach is used to measure the abnormal return which is the difference between the actual return of a sample firm and that of a control firm.

Event clustering for corporate announcements is a common problem inherent in many event studies. When the market-adjusted model is used to measure the share

price reaction of any corporate announcement, the announcement clustering problem may generate estimation bias in the computation of returns. To avoid the potential impact of event clustering, the control firm approach is employed to measure returns. A control firm is selected for abnormal return computation if the firm is clean from the event under examination, which, in this study, is the repurchase and insider trading activity. Furthermore, Barber and Lyon (1997) find that the control firm approach yields well-specified test statistics for the abnormal returns measured.

For the control firm approach, both the sample firm and the control firm selected for comparison should have similar characteristics in terms of market value and book-to-market value (Fama and French 1992)[9]. The monthly market value and book-to-market value of all the industrial firms in the PACAP database are computed and categorized into 10 groups. A control firm is matched to a sample firm if the control firm has the same rankings (from 1 to 10) of market value and book-to-market ratio as the sample firm does. As this study examines the abnormal share price reaction of the repurchasing firms, the control firm should have conducted no repurchase transaction during the examination period ($-30 \leq t \leq +250$).

Another objective of the study is to test if there are different share price reactions for the different "double" signals of share repurchase and insider trading (share repurchase paired with insider purchase and share repurchase paired with insider sale). Therefore, it is also an essential condition that the control firm selected should also be clean from the insider trading transactions during the examination period. With these four selection criteria, the original sample size of 8,295 observations is reduced to 3,290 observations for the event study.

[9] Monthly data are used to compute the market value and book-to-market value. The market value is the product of the number of outstanding shares and monthly average price. The book-to-market value is the ratio of the average book value of the shareholders' equity to market value of equity.

The share repurchase activity in Hong Kong is not a single-day event. Table 1 shows that there is a high frequency of share repurchase transactions (81% of the transactions are conducted within five days of a previous repurchase transaction). The repeated share repurchase transactions should lessen the pricing impact of the repurchasing signal on the market as the efficient market hypothesis argues that the share price reaction should be the most pronounced for the first released information. Therefore, the measurement of the abnormal return is restricted to those observations where there is no share repurchase transaction within a 5-day period before the observed transaction. This additional condition condenses the final sample to 687 observations.

Regression Model

In the share repurchase literature, many empirical studies have been conducted to explore the motivations for share repurchase. Dittmar (2000) tests six of the many hypotheses (excess capital hypothesis, dividend substitution hypothesis, undervaluation hypothesis, optimal leverage ratio hypothesis, takeover deterrence hypothesis and management incentive hypothesis) in a Tobit model. In this study, three of the hypotheses (free cash flow hypothesis, information signaling hypothesis and leverage hypothesis) are tested[10].

There are two regression models in the study. The dependent variables of the two regressions are the level of abnormal returns of repurchase transactions and the intensity of share repurchases. The first model with the level of abnormal returns as the dependent variable, examines the different motivations for share repurchases. The

[10] The anti-takeover mechanism and the management incentive hypotheses are not tested due to the limited number and availability of cases for analysis in Hong Kong.

second model distinguishes among different motivations of share repurchase with the aim of finding the motivation that best explains the repurchase decision[11].

The regressions are defined as :

$$CAR = \alpha_0 + \beta_1 CFY\text{-}1 + \beta_2 CashY\text{-}1 + \beta_3 DividendY\text{-}1 + \beta_4 MKBKRY\text{-}1 + \beta_5 AbRetY\text{-}1 + \beta_6 NetInsiderY + \beta_7 OWNY + \beta_8 LnTAY\text{-}1 + \beta_9 ReptranY + \beta_{10} InterIRY + \beta_{11} LeverageY\text{-}1 \quad (1)$$

$$RepshareY = \alpha_0 + \beta_1 CFY\text{-}1 + \beta_2 CashY\text{-}1 + \beta_3 DividendY\text{-}1 + \beta_4 MKBKRY\text{-}1 + \beta_5 AbRetY\text{-}1 + \beta_6 NetInsiderY + \beta_7 OWNY + \beta_8 LnTAY\text{-}1 + \beta_9 LeverageY\text{-}1 \quad (2)$$

CAR is the cumulative abnormal return over different time periods examined ($-1 \le t \le -1$, $-3 \le t \le +3$, $-10 \le t \le +200$, $-30 \le t \le +30$, $-30 \le t \le +120$ and $-30 \le t \le +200$). RepshareY is the measure of share repurchase activity (the ratio of the number of repurchased shares to the number of outstanding shares) at year y.

Excess Capital

If there is free cash flow in a firm, the firm may use the free cash for future investment, dividend distribution and share repurchase (Barclay and Smith 1988; Comment and Jarrell 1991; Ikenberry, Lakonishok and Vermaelen 1995; Stephens and Weisbach 1998; Jagannathan, Stephens and Weisbach 2000). CFY-1, CashY-1 and DividendY-1 are the three variables testing the free cash flow hypothesis. CFY-1 is the ratio of cashflow from operations to total assets at year y-1[12]. CashY-1 is the ratio of the sum of cash and marketable securities to total assets at year y-1.

[11] The second regression model is a censored regression (Tobit) model. In some model settings where the dependent variable is only partially observed, the Tobit regression model can be used. In equation (2), the values for RepshareY are identified for repurchasing firms. The values for RepshareY are left censored for non-repurchasing firms. Therefore, the Tobit model codes the censored dependent variable as zero.

DividendY-1 is the aggregate amount of dividends paid (interim, special cash and final) divided by net income before extraordinary items at year y-1.

Free Cash Flow

Firms can only launch their repurchase transactions if they have excess cash. Therefore, there should be a positive relation between CFY-1 and CashY-1 with RepshareY. Furthermore, if the share repurchase transaction is supported by sufficient cash flow, a positive relation is also expected between the abnormal returns for repurchase transactions and the motivation for share repurchase.

Substitute for Dividend Distribution

In the US where dividend income is taxable, there is a tax advantage from using share repurchases as an alternative means to dividend distribution to return free cash flow to shareholders (Barclay and Smith 1988). Share repurchases and dividends are substitutes of each other (Grullon and Michaely 2002). Stephens and Weisbach (1998) report that the dollar value of announced share repurchases is about 50% of total dividend payout (US$ 65 billion) in 1994. However, in Hong Kong, dividend income is not taxable. There is also no capital gains tax. Therefore, there is no tax preference between a share repurchase and a dividend. If share repurchases and dividends are substitutes of each because of the tax advantage of capital gains tax and personal tax, there should be a negative relation between DividendY-1 and RepshareY in the Tobit model. However, share repurchases can be a more flexible way for cash to be distributed than dividends as there is no market expectation for share repurchase to be

[12] Cash flow from operations is estimated by using the indirect method to convert operating income to operating cash flow.

a recurrent event[13]. Therefore, if there is a negative relation between DividendY-1 and RepshareY in the Tobit model using Hong Kong data, it will be due to the flexibility advantage offered by share repurchase as a means of returning excess and / or transitory cash flows to shareholders. However, if dividend and share repurchases are not substitutes, a positive distribution of dividend in the previous year and an additional distribution of excess capital to the investors in form of share repurchase is good news to the market. It is expected that there should be a positive relation between the abnormal returns for repurchase transactions and DividendY-1.

Information Signaling

The information signaling hypothesis argues that a share repurchase is motivated by the informational asymmetry between the firms and the outsiders. Several variables (MKBKRY-1, AbRetY-1, NetInsiderY, OWNY, LnTAY-1, ReptranY and InterIRY) are used as information asymmetry proxies to test the information signaling hypothesis. Justifications for these variables are provided below. MKBKRY-1 is the ratio of the sum of market value of equity and total liabilities to total assets at year y-1. AbRetY-1 is the market adjusted abnormal return from year end y-2 to year end y-1. NetInsiderY is the measure of insider trading activity (the percentage of net number of shares traded to the number of outstanding shares) at year y. OWNY is the percentage share ownership of insider trades at year y[14]. LnTAY-1 is the log value of total assets at year y-1. ReptranY is the measure of share repurchase activity (the log value of the number of repurchase transactions) at year y. InerIRY is an interactive

[13] There have been a lot of studies on dividend omissions and reduction in dividend distributions. Most of them find that dividend omissions and reduction have a negative signaling effect on the market (e.g., Bajaj and Vijh 1990; Denis, Denis and Sarin 1994).

[14] If there is more than one insider trading in the shares of the firm concerned, the percentages of the ownership of all the trading insiders involved are aggregated.

term of insider trading and share repurchase activities (the product of NetInsiderY and ReptranY).

Prior Firm Performance

The managements of firms are better informed than outsiders about the true value of the firms. Firms conduct share repurchases more aggressively if they believe their firms to be under-invested and to be undervalued (Stephens and Weisbach 1998; Ikenberry, Lakonishok and Vermaelen 2000). Ikenberry, Lakonishok and Vermaelen (2000) find that there is greater repurchase activity when share prices fall. To examine whether firms have the motive to repurchase when the share price is undervalued, Dittmar (2000) uses the market-to-book ratio and historical return as measures of undervaluation. In this study, the market-to-book ratio and the historical return are captured by MKBKRY-1 and AbRetY-1, respectively. The undervaluation hypothesis suggests that the abnormal returns for repurchasing firms and the share repurchase decision should be negatively related to the market-to-book ratio and historical return.

Insider Trading Activity

Besides using the market-to-book ratio and historical return as proxies of undervaluation, this study also employs insider trading measures to test the signaling hypothesis. If firms repurchase shares in order to take advantage of the undervaluation of their shares, the directors of the firms who trade in the market should also make use of the inside information of underpricing to make a "Buy" signal. Raad and Wu (1995) find that the shareholders of repurchasing firms with insider trading activities earn positive abnormal returns. If "Purchase" of shares is

motivated by undervaluation, there should be a positive relation between abnormal returns for repurchase and RepshareY with NetInsiderY.

Management Share-holding

The share-holding percentage is a proxy for the amount of the financial stake in the firm held by the directors. Higher ownership percentage indicates more private information is possessed. The buy-back signal is stronger, the higher the proportion of management ownership in the firms (Vermaelen 1981). Raad and Wu (1995) show that management ownership has a significant and positive effect on share return. In contrast, Vafeas and Waegelein (1998) find a significantly inverse relation between ownership and return performance. OWNY represents the ownership percentage held by the trading directors. It is expected that the level of abnormal returns will be higher if the ownership percentage associated with the person conducting the inside transaction is larger.

Firm Size

The hypothesis of undervaluation is based on the assumption that there is an informational difference between the insiders and outsiders about the true value of the firms. The degree of information asymmetry is expected to be inversely related to the size of the firms. Therefore, share repurchases made by small-size firms should signal more information than for large-size firms and empirical support for this has been documented (Vermaelen 1981; Lakonishok and Vermaelen 1990). It is also expected that the smaller firms are more likely to be misvalued. Therefore, there is a higher likelihood that smaller firms use share repurchases as a means to correct misvaluation. Firm size is estimated as the log value of total assets (LnTAY-1). A negative

(positive) relation is expected between firm size and abnormal returns (repurchase decision).

Share Repurchase

Many US studies examining the market reaction of share repurchase announcements report positive returns (Vermaelen 1981; Vermaelen 1984; Comment and Jarrell 1991; Ikenberry, Lakonishok and Vermaelen 1995). The finding of positive returns provides support to the information signaling hypothesis that undervaluation is a motivation for share repurchase. The relation between abnormal returns and the number of repurchase transactions is examined in regression model (1).

Interactive Term of Insider Trading and Repurchase Activities

Both insider trading and share repurchase are argued to be informative to investors. The individual impacts of insider trading and repurchase activities on the market are captured in NetInsiderY and ReptranY respectively. This study introduces an interactive term (InterIRY) to capture the combined effect of the informativeness of insider trading and repurchase activities. The significance of this variable provides evidence on the relative pricing effects of these two informed signals and the credibility of the undervaluation message.

Leverage

When firms have surplus cash flow, a share repurchase is one way to distribute the excess capital to investors. Likewise, when the firms have unused debt capacity, a share repurchase can also be a means to achieve the optimal leverage ratio. Besides finding evidence to support the signaling hypothesis, Pugh and Jahera (1990) also

mention that share repurchases can move the firms closer to their optimal capital structure. Firms with leverage ratios lower than the optimal level would be more likely to conduct share repurchases. Therefore, a negative relation is expected between LeverageY-1 and share repurchase activity. LeverageY-1 is the difference between the debt to asset ratio of firm i at year y-1 and the median debt-to-asset ratio of all firms of industry k at year y-1.

IV. Empirical Results

Abnormal Insider Trading Volume

This study examines the insider trading activity around the time when the firms undertake their share repurchase transactions. The results are shown in Table 2. Although Panel C of Table 1 documents that there are more insider purchases, Table 2 reports that insider purchase activity around a repurchase is abnormally and significantly lower than the expected level of insider share purchases. In contrast, an insider sale around a repurchase event is abnormally higher than the expected level of insider sales. During the repurchasing month, the insiders under-purchase and over-sell shares significantly. In terms of the number of transactions, the number of sale transactions is significantly higher than the expected number of sale transactions. For the seven months from m = -6 to m = 0, the net cumulative abnormal trading is significantly negative in terms of the number of shares and market value. The abnormal under-purchase result shows that there are inconsistent trading decisions made by the firms and by the directors for their personal accounts.

The inconsistent trading direction between the firms and the directors may be due to the threat of potential investigation by the Hong Kong Exchange. According to Rule 3 of Appendix 10 (Model Code for Securities Transactions by Directors of

Listed Companies) of the Listing Rules in Hong Kong, the directors are not allowed to conduct securities transactions during the period commencing one month immediately preceding any corporate events that can affect prices and market activity. Those directors conducting insider purchases before share repurchasing period may be questioned to have traded with price-sensitive information of the share repurchase information. On the contrary, insider sales before share repurchasing period can be justified by liquidity reasons. This may be the reason for the under-purchase and over-sale of shares before share repurchase transactions.

While Lee, Mikkelson and Partch (1992) report results consistent with the hypothesis that managers trade to personally benefit from the favourable undervaluation information, the inconsistent trading decisions found in this study suggest that the firms may not repurchase and / or the directors may not trade because they believe the shares are undervalued. If a share repurchase is motivated by the signaling purpose to convey an undervaluation message, the presence of insider sale transactions during the repurchasing period demonstrates an "irregular" trading pattern that contradicts the undervaluation argument. This study finds that there is insider selling activity by the directors before and during the time when the firms repurchase their own shares. The inconsistency in the trading patterns between the firms and the directors casts doubt on the information signaling hypothesis in explaining both the share repurchase and insider trading phenomena.

Abnormal Share Price Performance

Table 3 reports the event study results for share repurchase transactions from day -10 to day +200[15]. For the whole repurchase sample, the pre-event period (-10 $\leq$t

[15] Observations with abnormal returns in the top 1% and bottom 1% of the total observations are deleted in order to eliminate the effects of outliers. Both parametric and non-parametric tests are

$\leq$-1) abnormal return is negative and significant at the 0.1 level. This result is consistent with the hypothesis of this study and with previous studies (Vermaelen 1984; Comment and Jarrell 1991; Raad and Wu 1995) that firms buy their shares when they are at low prices. The positive abnormal returns in the post-event periods (significant at the +10 $\leq$t $\leq$+150 and +10 $\leq$t $\leq$+200 periods) indicate that the "Repurchase" action is effective in correcting the previous undervaluation.

To test the hypothesis that a "double purchase" by the firms and the directors gives a stronger signal of undervaluation to the market, the abnormal returns from day -10 to day +200 are measured. The whole sample is divided into three main groups. The "Repurchase and Sell" subsample includes events where there is a "buy" signal from the firms and a "sell" signal from the directors. The "Repurchase and Buy" subsample consists of cases where there are "buy" signals from both the firms and the directors. The "Repurchase" subsample refers to the share repurchase observations where there is no director trading during the specified period. It is expected that the abnormal returns should be the highest for the "Repurchase and Buy" subsample, followed by the "Repurchase" subsample and the "Repurchase and Sell" subsample.

Comparing the three subsamples for the two periods (-6 $\leq$m $\leq$-1 and m = 0), both the two "Buy" subsamples ("Repurchase and Buy" and "Repurchase Only") earn positive abnormal returns while the "Repurchase and Sell" suffers from negative abnormal returns. The positive returns for the "buy" signal indicate that the share repurchase and directors' purchase perform their signaling function to convey the undervaluation message. An informed purchase is a signal for a future increase in share price. In contrast to the expectation that the dual purchase signal from the firms and the directors should be a stronger signal of undervaluation, the "Repurchase and

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performed to check the significance of the abnormal returns. The two methods are qualitatively the same and only the results using the parametric method are reported.

Buy" subsample earns a lower level of returns than the "Repurchase Only" subsample in both short-term and long-term periods. The higher returns accruing to the "Repurchase Only" subsample indicate that share repurchases by the firms is a more credible signal of undervaluation than a directors' purchase. The smaller returns for the "Repurchase and Buy" subsample seem to suggest that the "Buy" signal from a directors' purchase is not as successful as the "Buy" signal from the firms in expressing the undervaluation message.

Although the share repurchase signal is a credible message of undervaluation, it is not as effective as the "Sell" signal in conveying an overvaluation message. The negative abnormal returns in the "Repurchase and Sell" subsample mean that a directors' sale is a stronger signal than a share repurchase. The differences in abnormal returns for different combinations of share repurchase and directors' trading suggest that the market evaluates the joint signals. The magnitude of the share price movement reflects the strength of the different signals of informed trading.

Regression Analysis

The results of the regression analysis with the abnormal returns as the dependent variable (regression model (1)) and the Tobit model (regression model (2)) are reported in Table 4. The relation between the magnitude of the market reaction and the variables (CFY-1, CashY-1, DividendY-1, MKBKRY-1, AbRetY-1, NetInsiderY, OWNY, LnTAY-1, ReptranY, InterIRY and LeverageY-1) are examined over both the short-term ($-1 \leq t \leq -1$, $-3 \leq t \leq +3$) and the long-term ($-10 \leq t \leq +200$, $-30 \leq t \leq +30$, $-30 \leq t \leq +120$ and $-30 \leq t \leq +200$) periods. The t-statistics for the coefficients in the regressions are adjusted for heteroskedasticity using White's procedure (1980).

Excess Capital

Stephens and Weisbach (1998) report a positively significant relation between share repurchase and cash flow (expected as well as unexpected cash flow). In many sample periods, Dittmar (2000) finds that firms do not replace dividends with share repurchases but use buy-backs as an alternative means to distribute excess cash. In Table 4, the only variable testing the free cash flow hypothesis which is significant is CFY-1. The positive significance of CFY-1 in model (1) suggests that the market reaction and motivation for a share repurchase are determined by the amount of excess cash flow. However, the regression result (model (2)) shows that share repurchases and dividends (DividendY-1) are not substitutes.

Information Signaling

Table 4 reports that MKBKRY-1 is significantly and AbRetY-1 is insignificantly related to the level of abnormal returns (model (1)). The negative coefficients on MKBKRY-1 are consistent with those of Lakonishok, Shleifer and Vishny (1994), Ikenberry, Lakonishok and Vermaelen (1995) and Dittmar (2000) which show that firms with low market-to-book value are undervalued and under-invested. Therefore, share repurchase activity is a signal to the market that firms invest in their own shares when their shares are at a low price. However, MKBKRY-1 is not significant in the Tobit model. Although a low market-to-book ratio is an indicator of undervaluation and underinvestment, share repurchases may not necessarily be the only investment to consume the asset potential. Similar to the finding of Dittmar (2000) on historical return, AbRetY-1 is not significant in model (2). However, Stephens and Weisbach (1998) report a negatively significant relation between quarterly share repurchases and previous quarter returns. As Stephens and Weisbach use quarterly data and

Dittmar as well as this study use yearly data, the insignificance of AbRetY-1 may be due to the mismatch of time periods used to measure historical return and share repurchase activity.

The coefficients on NetInsiderY [16] are not significant in Table 4. The insignificance of the variable representing insider trading activity suggests that the market reaction around the repurchasing period is not affected by the trading of the directors. The inconsistent trading signals (buy and sell around the share repurchase transactions) of the directors may have confused the market. While it is hypothesized that there should be a positive relation between share price performance and ownership percentage of trading directors (OWNY), a negative association is found in this study. The negative and significant relation between the ownership percentage and abnormal returns is inconsistent with that of Raad and Wu (1995) but provides support to the entrenchment hypothesis (Morck, Shleifer and Vishny 1988; McConnell and Servaes 1990; Kole 1995). The entrenchment hypothesis suggests that the lower the percentage of management shareholding, the higher the value of the firm. Both NetInsiderY and OWNY are not significant in the Tobit model. These results imply that the directors do not make consistent trading decisions for their firms and their personal accounts.

The coefficients on LnTAY-1 [17] are negatively and positively significant in model (1) and model (2) respectively. The negative relation between the market reaction to share repurchase transactions and firm size indicates that share repurchase activity is more effective in correcting the misvaluation or underpricing for smaller

[16] Besides using the net number of shares as an insider trading measure, this study repeats the regression analysis with other measures such as the number of purchased shares, the number of sold shares, market value (net, purchased and sold) and number of transactions (purchased and sold). The results are qualitatively the same across all measures.

[17] This study also uses the log value of the market value of the firm (closing price times the number of outstanding shares) as the proxy of firm size. The results are qualitatively the same as those when the log value of total assets is used.

firms. However, the positive and significant coefficient on LNTAY-1 in the Tobit model shows that there is a higher likelihood for larger firms to conduct a share repurchase. Dittmar (2000) argues that large firms may also be misvalued and use share repurchases to buy misvalued shares. Owing to the limited information disclosure[18] and the highly concentrated ownership structure by families in Hong Kong (Claessens, Djankov and Lang 2000), the degree of informational difference between the market and the firms may not necessarily depend on the size of the firms. Share repurchase can be a means for both large and small firms to reveal the true value of the firms. However, large firms may have more asset potential to conduct the repurchase investment.

While there is an insignificant relation between abnormal returns and insider trading activity, the positive and significant coefficients of ReptranY, particularly over the long-term, provide evidence on signaling as a motivation for share repurchases. The insignificance of NetInsiderY and InterIRY in regression model (1) indicates that share repurchase is a stronger and more credible signal than directors' trading in signaling undervaluation. The frequency of repurchase activity is positively related to the magnitude of abnormal returns.

Leverage

Dittmar (2000) finds evidence that a share repurchase can be used to alter the leverage ratios. The Tobit model result shows that there is a negative but insignificant relation between the leverage ratio[19] and the share repurchase decision. This finding implies that firms with a lower than optimal leverage ratio are more likely to

[18] There are few voluntary information disclosures made by the management of the firms in Hong Kong. External analyst reports are usually restricted to a few large firms.

repurchase shares. However, a low leverage ratio is not a significant factor that motivates firms to engage in share repurchase activity. LeverageY-1 is positively related to the level of abnormal returns in regression model (1). If firms with a high leverage ratio are perceived as poorly performing firms, highly geared firms should have a history of low returns. Therefore, the market reaction around the share repurchase transactions may express an undervaluation signal leading to an increase in price.

V. Conclusion

This study makes use of the insider trading data around the repurchasing period in order to examine the information signaling motivation for share repurchases in Hong Kong. Analyses are performed to investigate the intensity of the insider trading activity and share price reaction during the time when the firms buy their shares back. The directors do not exclusively make a purchase decision for their own investment portfolios to complement the buy-back transactions of the firms, they also make sell transactions. Although the quantity and value of directors' purchases are higher than those of sales, the intensity of buying activity is not abnormally greater than that of the selling activity during the share repurchase period. On the contrary, the net insider trading activity is negatively significant.

The results from the event study provide support for the information signaling hypothesis that the "Buy" signal earns positive abnormal returns. The market does not evaluate the various signals of informed trading in isolation. Although, the "Buy" signal can perform its signaling function to express an undervaluation message, the higher abnormal returns for the "Repurchase Only" subsample suggest that the

[19] The leverage measure used in the regression model is the ratio of net debt to total assets. For robustness, the regression analysis is repeated with another measure of leverage (total debt to total

"Repurchase" signal of the firms is a more credible signal for undervaluation than the "Purchase" signal of the directors. However, the signaling power of the undervaluation message conveyed by the "Repurchase" transactions of the firms is not as effective as that of the overvaluation message revealed by the "Sell" transactions of the directors. Negative abnormal returns are found for the "Repurchase and Sell" subsample.

The regression analysis shows that those variables (MKBKRY-1, LnTAY-1 and ReptranY) representing the proxies of undervaluation and capital structure (LeverageY-1) exert more influence on the magnitude of abnormal returns for share repurchases. However, the Tobit model does not provide evidence that information signaling is a dominant factor in motivating the share repurchase decision.

In conclusion, this study provides weak evidence for the information signaling purpose of share repurchases. It is assumed that there should be consistent signal conveyed by share repurchases and directors' dealings (i.e., a share repurchase with a director purchase rather than a share repurchase with a director sale) in order to transmit a credible undervaluation message. Although the abnormal share price analysis shows that there are abnormal returns for the "Repurchase" and "Repurchase and Buy" subsamples, the results from the abnormal informed trading volume analysis report that the director purchase activity is not abnormally greater. In addition, the Tobit analysis finds that the information signaling function is not a major purpose for share repurchase.

These findings are in contrast to those reported in the US studies. In the US, share repurchase is a good and true signal for undervaluation. The insiders buy before the share repurchasing period. In Hong Kong, owing to various reasons such as share price manipulation and sequencing of corporate events by the firms, it is not clear

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assets). However, the use of different leverage measures does not change the results qualitatively.

whether share repurchase is being used as a tool to increase or to boost up share price, rather than serving as a signal for undervalued share.

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Table 1
Summary Statistics of the Sample (1993 – 1999)

Panel A : Characteristics of Share Repurchase Activity

Year	Number of Firms	Number of Shares ('000,000)	Market Value (HK$'000,000)	Number of Transactions	Percentage of Repurchased Shares to Outstanding Shares	Cumulative Percentage of Repurchased Shares to Outstanding Shares
1993	22	219.19	297.11	224	0.09%	0.91%
1994	83	610.64	2,179.72	1,344	0.06%	1.02%
1995	82	365.18	1,071.17	1,363	0.05%	0.76%
1996	50	344.27	994.32	685	0.10%	1.40%
1997	131	1,345.60	6,950.19	1,554	0.10%	1.16%
1998	137	1,066.17	2,947.72	2,116	0.05%	0.88%
1999	63	777.28	13,895.84	1,009	0.08%	1.28%
Total	264	4,728.32	28,336.06	8,295		
Average					0.08%	1.06%

Panel B : Distribution of Time Length between Two Consecutive Repurchase Transactions in terms of the Number of Trading Days

Time Length in terms of Number of Trading Days	Number of Repurchase Transactions	Percentage to Total Number of Repurchase Transactions	Cumulative Percentage to Total Repurchase Transactions
1	4,639	57.76%	57.76%
2	964	12.00%	69.77%
3	440	5.48%	75.25%
4	284	3.54%	78.78%
5	203	2.53%	81.31%
6	150	1.87%	83.18%
7	94	1.17%	84.35%
8	92	1.15%	85.49%
9	79	0.98%	86.48%
10	64	0.80%	87.27%
11	54	0.67%	87.95%
12	44	0.55%	88.49%
13	35	0.44%	88.93%
14	38	0.47%	89.40%
15	34	0.42%	89.83%
16	32	0.40%	90.23%
17	22	0.27%	90.50%
18	19	0.24%	90.74%
19	25	0.31%	91.05%
20	24	0.30%	91.35%
> 20	695	8.65%	100.00%
Total	8,031		
Average	12.80		

Table 1 (continued)
Summary Statistics of the Sample (1993 – 1999)

Panel C : Insider Trading Activity around Share Repurchase Event

"Buy" sample consists of inside transaction where there is a net purchase of shares (the quantity of shares purchased exceeds the quantity of shares sold). "Sell" sample consists of inside transaction where there is a net sale of shares (the quantity of shares sold exceeds the quantity of shares purchased). "Net" is the difference between "Buy" and "Sell" samples. A positive (negative) sign for the "Net" indicates there is a higher (lower) value for "Buy" sample than for "Sell" sample.

	Number of Shares ('000,000)			Market Value (HK$'000,000)			Number of Transactions		
Repurchase	Buy	Sell	Net	Buy	Sell	Net	Buy	Sell	Net
Event Month	Total Insider Trading Activity (Average Insider Trading Activity per Repurchase Transaction)								
-6	14,933	3,182	11,752	58,054	8,580	49,474	10,866	2,116	8,750
	(8.62)	(4.16)	(5.34)	(33.52)	(11.22)	(22.49)	(6.27)	(2.77)	(3.98)
-5	9,662	2,824	6,838	39,033	11,776	27,258	8,833	2,208	6,625
	(5.53)	(3.88)	(3.10)	(22.36)	(16.20)	(12.37)	(5.06)	(3.04)	(3.01)
-4	6,848	5,806	1,042	25,273	12,820	12,453	8,244	1,690	6,554
	(4.37)	(9.38)	(0.53)	(16.14)	(20.71)	(6.38)	(5.26)	(2.73)	(3.36)
-3	7,137	4,786	2,352	21,239	10,727	10,512	7,815	1,744	6,071
	(4.27)	(8.61)	(1.17)	(12.70)	(19.29)	(5.22)	(4.67)	(3.14)	(3.01)
-2	7,060	2,621	4,439	20,025	5,863	14,163	6,877	1,186	5,691
	(4.40)	(4.87)	(2.26)	(12.47)	(10.90)	(7.22)	(4.28)	(2.20)	(2.90)
-1	7,560	4,053	3,507	19,949	7,582	12,366	8,176	1,534	6,642
	(4.24)	(7.53)	(1.67)	(11.18)	(14.09)	(5.90)	(4.58)	(2.85)	(3.17)
0	5,231	10,127	-4,896	12,768	4,809	7,959	7,903	1,584	6,319
	(3.10)	(17.58)	(-2.39)	(7.57)	(8.35)	(3.89)	(4.69)	(2.75)	(3.09)
+1	7,450	4,403	3,048	19,494	6,648	12,847	6,683	1,881	4,802
	(5.30)	(7.67)	(1.68)	(13.86)	(11.58)	(7.06)	(4.75)	(3.28)	(2.64)
+2	4,700	5,515	-815	9,118	4,846	4,272	6,919	1,998	4,921
	(3.48)	(8.94)	(-0.46)	(6.75)	(7.85)	(2.41)	(5.13)	(3.24)	(2.77)
+3	5,258	3,806	1,451	8,696	9,261	-565	6,343	2,386	3,957
	(4.15)	(5.67)	(0.85)	(6.86)	(13.80)	(-0.33)	(5.00)	(3.56)	(2.31)
+4	3,308	6,184	-2,876	6,442	21,598	-15,157	5,966	2,114	3,852
	(2.60)	(8.92)	(-1.66)	(5.06)	(31.17)	(-8.74)	(4.69)	(3.05)	(2.22)
+5	4,703	3,469	1,234	7,422	10,194	-2,772	6,354	2,116	4,238
	(3.54)	(5.00)	(0.69)	(5.58)	(14.69)	(-1.54)	(4.78)	(3.05)	(2.36)
+6	3,681	11,877	-8,196	8,642	10,071	-1,429	6,336	2,749	3,587
	(2.84)	(14.75)	(-4.40)	(6.67)	(12.51)	(-0.77)	(4.89)	(3.41)	(1.93)

Table 2

Average Abnormal Insider Trading Activity Around Share Repurchase Event

"Buy" sample consists of inside transaction where there is a net purchase of shares (the quantity of shares purchased exceeds the quantity of shares sold). "Sell" sample consists of inside transaction where there is a net sale of shares (the quantity of shares sold exceeds the quantity of shares purchased). "Net" is the difference between "Buy" and "Sell" samples. A positive (negative) sign for the "Net" indicates there is a higher (lower) value for "Buy" sample than for "Sell" sample.

	Number of Shares ('000,000)			Market Value (HK$'000,000)			Number of Transactions		
	Buy	Sell	Net	Buy	Sell	Net	Buy	Sell	Net
Event Month	Average Abnormal Insider Trading Activity (t – statistics)								
-6	-2.2246	2.2702	-0.7751	-4.5067	5.6160	-2.4698	-0.0271	0.9166	-0.2475
	(-1.94)*	(0.58)	(-0.39)	(-0.56)	(0.28)	(-0.23)	(-0.04)	(6.22)***	(-0.43)
-5	-4.7786	2.8850	-2.6693	-13.4748	12.6800	-11.9057	-0.4526	1.3011	-0.7250
	(-4.16)***	(0.73)	(-1.35)	(-1.67)*	(0.62)	(-1.10)	(-0.67)	(8.83)***	(-1.26)
-4	-3.5799	7.1205	-3.9069	-15.5808	14.4574	-14.4617	-0.0747	1.0419	-0.1681
	(-3.12)***	(1.81)*	(-1.98)**	(-1.94)*	(0.71)	(-1.34)	(-0.11)	(7.07)***	(-0.29)
-3	-2.6966	6.3524	-3.5109	-17.5084	14.0494	-17.4063	-0.3205	1.8232	-0.4417
	(-2.35)**	(1.62)	(-1.78)*	(-2.17)**	(0.69)	(-1.61)	(-0.48)	(12.37)***	(-0.77)
-2	-3.8429	2.2817	-3.0817	-15.5997	5.0775	-13.2981	-0.9464	1.0196	-0.7668
	(-3.34)***	(0.58)	(-1.56)	(-1.94)*	(0.25)	(-1.23)	(-1.41)	(6.92)***	(-1.34)
-1	-1.3612	4.1147	-1.3572	-7.3913	5.2776	-4.3717	0.3180	1.2468	0.1887
	(-1.18)	(1.05)	(-0.69)	(-0.92)	(0.26)	(-0.41)	(0.47)	(8.46)***	(0.33)
0	-2.8577	8.8398	-3.9595	-14.5861	-34.0654	-1.5013	0.6332	1.4142	0.2690
	(-2.49)**	(2.25)**	(-2.01)**	(-1.81)*	(-1.67)*	(-0.14)	(0.94)	(9.59)***	(0.47)
+1	-2.4670	6.0011	-0.4372	-13.0040	6.4799	0.6368	0.5381	1.9686	-0.4482
	(-2.15)**	(1.53)	(-0.22)	(-1.62)	(0.32)	(0.06)	(0.80)	(13.35)***	(-0.78)
+2	-1.7293	6.0840	-4.9883	-12.0963	1.1002	-14.6523	1.3273	2.0227	-0.4179
	(-1.50)	(1.55)	(-2.53)**	(-1.50)	(0.05)	(-1.36)	(1.98)*	(13.72)***	(-0.73)
+3	-2.2345	-3.5870	-0.9990	-14.8967	-25.6511	-5.4151	0.9559	2.3372	-0.8974
	(-1.94)*	(-0.91)	(-0.51)	(-1.85)*	(-1.26)	(-0.50)	(1.42)	(15.85)***	(-1.56)
+4	-3.9598	3.3116	-2.8463	-18.7446	7.6635	-12.5626	0.0227	1.9655	-1.1491
	(-3.45)***	(0.84)	(-1.44)	(-2.33)**	(0.38)	(-1.16)	(0.03)	(13.33)***	(-2.00)**
+5	-1.5014	-2.3167	-0.8986	-16.7666	-19.1287	-8.0040	0.4552	1.8949	-1.3321
	(-1.31)	(-0.59)	(-0.46)	(-2.08)**	(-0.94)	(-0.74)	(0.68)	(12.85)***	(-2.32)**
+6	-2.1998	13.1214	-9.1767	-13.7596	8.1006	-23.4023	0.7770	2.2704	-1.8747
	(-1.91)*	(3.34)***	(-4.66)***	(-1.71)*	(0.40)	(-2.17)**	(1.16)	(15.40)***	(-3.27)***
-6 – 0	-21.3416	33.8643	-19.2604	-88.6477	23.0925	-65.4147	-0.8701	8.7635	-1.8913
	(-7.02)***	(3.26)***	(-3.69)***	(-4.16)***	(0.43)	(-2.29)**	(-0.49)	(22.47)***	(-1.25)
+1 - +6	-14.0918	22.6145	-19.3462	-89.2679	-21.4356	-63.3996	4.0761	12.4592	-6.1194
	(-5.01)***	(2.35)**	(-4.01)***	(-4.53)***	(-0.43)	(-2.40)**	(2.48)**	(34.50)***	(-4.35)***

*** significant at the 0.01 level

** significant at the 0.05 level

* significant at the 0.1 level

Table 3

Average Abnormal Returns (AARs) and Cumulative Abnormal Returns (CARs) for Share Repurchase Activity

"Buy" sample consists of inside transaction where there is a net purchase of shares (the quantity of shares purchased exceeds the quantity of shares sold). "Sell" sample consists of inside transaction where there is a net sale of shares (the quantity of shares sold exceeds the quantity of shares purchased). N is the number of observations in the sample. t-statistics for AARs and CARs are shown in parentheses.

		Month -6 to Month -1			Month Zero		
	Whole Repurchase Sample (N = 687)	Repurchase and Sell (N = 72)	Repurchase and Buy (N = 219)	Repurchase Only (N = 288)	Repurchase and Sell (N = 29)	Repurchase and Buy (N = 125)	Repurchase Only (N = 512)
Event Day				AAR / CAR (t-statistics)			
-10-1	-0.0134	-0.0230	-0.0226	0.0015	-0.0482	-0.0154	-0.0062
	(-1.85)*	(-1.17)	(-1.61)	(0.14)	(-1.56)	(-0.97)	(-0.72)
-1+1	0.0005	-0.0173	0.0077	0.0035	-0.0108	0.0002	0.0027
	(0.13)	(-1.61)	(1.00)	(0.58)	(-0.64)	(0.02)	(0.57)
-3+3	-0.0078	-0.0170	-0.0015	0.0009	-0.0501	-0.0039	-0.0021
	(-1.28)	(-1.04)	(-0.13)	(0.10)	(-1.94)*	(-0.29)	(-0.30)
-5+5	-0.0088	-0.0335	0.0099	0.0095	-0.0813	-0.0014	-0.0015
	(-1.15)	(-1.63)	(0.67)	(0.82)	(-2.51)**	(-0.09)	(-0.17)
-10+10	-0.0130	-0.0353	0.0039	0.0073	-0.0900	-0.0105	-0.0014
	(-1.23)	(-1.24)	(0.19)	(0.45)	(-2.01)**	(-0.46)	(-0.11)
0	0.0021	-0.0086	0.0034	0.0061	-0.0131	-0.0067	0.0060
	(0.91)	(-1.38)	(0.76)	(1.76)*	(-1.34)	(-1.34)	(2.20)**
+10+30	0.0005	-0.0148	0.0037	0.0063	0.0203	-0.0052	0.0007
	(0.05)	(-0.52)	(0.18)	(0.40)	(0.45)	(-0.22)	(0.05)
+10+60	0.0060	-0.0159	0.0036	0.0130	-0.0296	-0.0032	0.0138
	(0.37)	(-0.36)	(0.11)	(0.52)	(-0.42)	(-0.09)	(0.71)
+10+90	0.0235	-0.0383	0.0198	0.0369	-0.1322	0.0296	0.0390
	(1.14)	(-0.69)	(0.50)	(1.17)	(-1.50)	(0.66)	(1.59)
+10+120	0.0245	-0.0722	0.0374	0.0466	-0.1298	0.0173	0.0482
	(1.01)	(-1.10)	(0.80)	(1.27)	(-1.26)	(0.33)	(1.68)*
+10+150	0.0495	-0.0678	0.0658	0.0991	-0.1158	0.0276	0.0840
	(1.82)*	(-0.92)	(1.25)	(2.39)**	(-1.00)	(0.46)	(2.60)***
+10+200	0.0926	-0.0485	0.1279	0.1552	-0.0224	0.0661	0.1267
	(2.92)***	(-0.56)	(2.09)**	(3.21)***	(-0.17)	(0.95)	(3.37)***

*** significant at the 0.01 level

** significant at the 0.05 level

* significant at the 0.1 level

Table 4
Regression Analysis

$$CAR = \alpha_0 + \beta_1 CFY\text{-}1 + \beta_2 CashY\text{-}1 + \beta_3 DividendY\text{-}1 + \beta_4 MKBKRY\text{-}1 + \beta_5 AbRetY\text{-}1 + \beta_6 NetInsiderY + \beta_7 OWNY + \beta_8 LnTAY\text{-}1 + \beta_9 ReptranY + \beta_{10} InterIRY + \beta_{11} LeverageY\text{-}1 \quad (1)$$

$$RepshareY = \alpha_0 + \beta_1 CFY\text{-}1 + \beta_2 CashY\text{-}1 + \beta_3 DividendY\text{-}1 + \beta_4 MKBKRY\text{-}1 + \beta_5 AbRetY\text{-}1 + \beta_6 NetInsiderY + \beta_7 OWNY + \beta_8 LnTAY\text{-}1 + \beta_9 LeverageY\text{-}1 \quad (2)$$

CAR is average abnormal return or cumulative abnormal return over different time periods examined. CFY-1 is the ratio of cashflow from operations to total assets at year y-1. CashY-1 is the ratio of the sum of cash and marketable securities to total asset at year y-1. DividendY-1 is the aggregate amount of dividends paid (interim, special cash and final) divided by net income before extraordinary items at year y-1. MKBKRY-1 is the ratio of the sum of market value of equity and total liabilities to total assets at year y-1. AbRetY-1 is the market adjusted abnormal return from year end y-2 to year end y-1. NetInsiderY is the measure of insider trading activity (percentage of net number of shares traded to the number of outstanding shares) at year y. OWNY is the percentage of trading insider ownership to number of outstanding shares at year y. LnTAY-1 is the log value of total assets at year y-1. ReptranY is the log value of the number of transactions at year y. InterIRY is an interactive term of insider trading and share repurchase activities (the product of NetInsiderY and ReptranY). LeverageY-1 is the difference between the debt to asset ratio of firm i at year y-1 and the median debt-to-asset ratio of all firms of industry k at year y-1. RepshareY is the ratio of the number of repurchased shares to the number of outstanding shares at year y. t-statistics are adjusted for heteroskedasticity with White's procedure (1980).

	Model (1)						Model (2)
	$-1 \le \le 1$	$-3 \le \le 3$	$-10 \le \le 200$	$-30 \le \le 30$	$-30 \le \le 120$	$-30 \le \le 200$	
	Coefficient (t-statistics)						(z-value)
Intercept	0.0741	0.0702	0.5952	0.2656	0.4140	0.6030	-0.0630
	(1.53)	(1.09)	(2.41)	(1.76)	(1.96)	(2.34)	(-5.44)
CFY-1	0.0490	0.0738	0.4222	-0.0124	0.0955	0.4489	0.0036
	(1.54)	(1.62)	(2.09)**	(-0.11)	(0.57)	(2.01)**	(0.51)
CashY-1	0.0903	0.0982	0.5300	0.2567	0.4082	0.5572	-0.0051
	(1.44)	(1.14)	(1.56)	(1.49)	(1.29)	(1.53)	(-0.40)
DividendY-1	0.0140	-0.0027	0.0151	-0.0059	-0.0110	0.0148	0.0005
	(1.62)	(-0.17)	(0.70)	(-0.69)	(-0.67)	(0.63)	(0.61)
MKBKRY-1	-0.0085	-0.0096	-0.0521	-0.0444	-0.0492	-0.0616	-0.0003
	(-3.39)***	(-2.79)***	(-2.88)**	(-3.28)***	(-2.82)***	(-2.95)***	(-0.32)
AbRetY-1	0.0067	0.0009	-0.0456	-0.0354	-0.0404	-0.0569	0.0016
	(0.96)	(0.09)	(-0.85)	(-1.35)	(-0.90)	(-0.95)	(0.83)
NetInsiderY	0.2632	0.1312	-0.1856	-0.5111	-1.5851	-0.3381	0.0004
	(1.09)	(0.45)	(-0.09)	(-0.62)	(-0.91)	(-0.17)	(0.02)
OWNY	-0.0100	-0.0321	-0.1650	-0.0602	-0.0627	-0.2019	0.0065
	(-0.70)	(-1.57)	(-2.11)**	(-1.26)	(-0.94)	(-2.38)**	(1.74)
LnTAY-1	-0.0058	-0.0051	-0.0539	-0.0220	-0.0403	-0.0566	0.0026
	(-1.90)	(-1.27)	(-3.53)***	(-2.39)**	(-3.07)***	(-3.55)***	(3.53)***
ReptranY	0.0032	0.0031	0.0928	0.0306	0.0718	0.1075	
	(0.77)	(0.62)	(3.96)***	(2.18)**	(3.29)***	(4.25)***	
InterIRY	-0.0491	0.0070	0.4730	0.4214	0.9246	0.6392	
	(-0.50)	(0.06)	(0.66)	(1.32)	(1.43)	(0.92)	
LeverageY-1	0.0141	0.0376	0.4539	0.2091	0.3323	0.5120	-0.0074
	(0.45)	(0.84)	(2.73)***	(2.10)**	(2.27)**	(2.85)***	(-1.13)
Adjusted R^2	0.0132	-0.0013	0.0922	0.0612	0.0652	0.1109	0.0014
F	1.3139	0.9671	4.3972	3.0736	3.3095	5.1832	
	(0.22)	(0.48)	(0.00)	(0.00)	(0.00)	(0.00)	

*** significant at the 0.01 level

** significant at the 0.05 level

Appendix 1

Summary Statistics of the Sample (1993 – 1999)

Insider Trading Activity (in terms of Trading Volume in Percentage of Shares Outstanding and Trading Value in Percentage of Firm Market Value) around Share Repurchase Event

"Buy" sample consists of inside transaction where there is a net purchase of shares (the quantity of shares purchased exceeds the quantity of shares sold). "Sell" sample consists of inside transaction where there is a net sale of shares (the quantity of shares sold exceeds the quantity of shares purchased). "Net" is the difference between "Buy" and "Sell" samples. A positive (negative) sign for the "Net" indicates there is a higher (lower) value for "Buy" sample than for "Sell" sample.

Event	Trading Volume in Percentage of Shares Outstanding			Trading Value in Percentage of Firm Market Value		
Month	Buy	Sell	Net	Buy	Sell	Net
-6	0.0075	0.0089	0.0076	0.0105	0.0134	0.0102
-5	0.0056	0.0070	0.0056	0.0086	0.0144	0.0087
-4	0.0056	0.0106	0.0066	0.0073	0.0156	0.0093
-3	0.0041	0.0107	0.0048	0.0055	0.0146	0.0064
-2	0.0042	0.0065	0.0048	0.0053	0.0080	0.0060
-1	0.0039	0.0073	0.0034	0.0042	0.0087	0.0033
0	0.0032	0.0082	0.0034	0.0031	0.0069	0.0032
+1	0.0050	0.0070	0.0050	0.0049	0.0081	0.0054
+2	0.0036	0.0070	0.0032	0.0032	0.0067	0.0039
+3	0.0036	0.0056	0.0029	0.0034	0.0059	0.0024
+4	0.0035	0.0100	0.0018	0.0034	0.0122	0.0016
+5	0.0041	0.0083	0.0047	0.0052	0.0093	0.0058
+6	0.0040	0.0117	0.0040	0.0051	0.0106	0.0045