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The Reaction Of The Canadian Secondary Market In Equities To Large Value Transactions

Nicholas Close

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THE REACTION OF THE CANADIAN SECONDARY MARKET IN
EQUITIES TO LARGE VALUE TRANSACTIONS

by

Nicholas Close

School of Business Administration

Submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

Faculty of Graduate Studies
The University of Western Ontario
London, Canada
April 1973

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ABSTRACT

The object of this thesis is to determine what effect large value transactions have on the prices of stocks listed on the two largest Canadian stock exchanges. Three possible effects as suggested by the literature are proposed, namely: 1) Because stocks are good substitutes for one another and over supply or, demand for a particular stock will be quickly dissipated by investors substituting other stocks, hence large price movements will not appear. 2) There is a cost to the liquidity provided in trading large values that is reflected in temporary price movements. 3) Large value transactions are associated with new information about particular stocks and any change in price at the time of large value trades is due to this.

To determine which situation, if any, applies to the Canadian stock exchanges, daily price and volume impacts are calculated for a large number of actual large value transactions over a six week period centered on the day of the trade. Large value transactions are defined as trades over $100,000 which meet the exchanges' volume discount requirements and secondary distributions over $250,000. Price impacts are essentially a stock's change in price from one period to another adjusted for its normal relation
to the market as a whole, any dividends paid, splits, rights issues, etc. Volume impacts are developed in a parallel manner. In addition to calculating aggregate price and volume impacts for trades classified as buys and for trades classified as sells, the relationships between impacts and the value of the trade, the time taken to trade and the type of stock as classified by the relative institutional interest in the stock, are examined.

Results of the empirical study suggest that large value transactions which are purchases tend to be associated with about a two per cent increase in the stock's price that does not recover (decrease) in at least the three week period after the trade. Sales appear to be associated with only a small drop in price, about one half of one per cent, and this drop fully recovers within two weeks after the trade. In addition, price effects do not appear to be significantly related to the value of the transaction or the time the trade took to be executed. There is, however, a marked difference in price impacts for stocks classified as having a low institutional interest versus stocks with a high institutional interest. All large value transactions are found to be associated with periods of high volumes before, during and after the trading period. The overall conclusion reached is that large value purchases tend to result in "permanent" upward price changes best explained by theory 3 mentioned
above, while for sales theory 2 seems most applicable. Implications of the results for institutional investors, brokers, the public and the stock exchanges themselves are discussed, and suggestions for further work are made.
ACKNOWLEDGEMENTS

From the outset I set out to produce a study that would be of some relevance to the business community and as such through every stage of the project's development a close liaison was maintained. It turns out that such a study becomes paradoxically, dependent upon the group it sets out to relate with and accordingly I would like to acknowledge here the help and assistance I received from many individuals and companies in the Canadian securities industry. In particular I would like to thank the Montreal and Toronto Stock Exchanges for their co-operation in providing data on large value transactions, and the Financial Research Institute for allowing me to access their price data bank. A project of this nature would have been incredibly laborious without the type of automated data banks maintained by the Financial Research Institute.

The study was financed by grants from Shell Canada Limited and Rio Algom Mines Limited through their doctoral research grants programs. Personal support was received from the Province of Quebec and the Canada Council through their doctoral fellowships and from the J. E. Brent and Richard Ivey Foundations. I gratefully acknowledge the generous contributions of these institutions.
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CHAPTER 1

THE PROBLEM

Object of the Study

The object of this study is to investigate the effects of large value transactions in the Canadian secondary equity markets. The two dependent variables to be monitored will be daily closing price, and the daily volume (number of shares bought and sold) of stocks before, on the day and after a large trade. The research questions asked are: Do large value transactions affect the price and trading volumes of stocks? If so, what is the nature of the effect and what is the underlying causal relationship? If not, why not?

This chapter introduces the study, its importance and implications. Chapter Two discusses previous work done in this area, while Chapter Three presents a theoretical model of how the price of a stock and the volume of trading in that stock might be affected by a large transaction. These models lead to 15 research hypotheses which, together with their implications, are described in Chapter Four. Chapter Five outlines a sampling plan and an empirical study designed to test these hypotheses. Chapter Six reports
the analytical results relating them to the model presented in Chapter Three. Finally, conclusions and implications, as well as suggestions for further research, are presented in Chapter Seven.

Statement of the Problem:

There are two types of financial markets, the primary and secondary markets.

The primary market for equities is the market where corporations desiring funds offer shares of the corporation to the public in exchange for funds. The usual procedure is for the corporation to sell equity in the form of a new issue of common stock to an underwriter. The underwriter in turn sells these shares to the public. The public in this case is composed of individual investors and financial institutions. Once issued the shares are usually traded on some sort of organized exchange called the secondary market. Through this mechanism investors are able to sell the securities they originally bought from the underwriter, or they are able to buy more.

The Secondary Market for Equities

The key feature distinguishing the secondary market from the primary market is that the latter involves a funds flow from investors to the corporations whose stocks are sold. In the secondary market funds flow between investors
only.

Transactions in a corporation's stock in the secondary market do not directly affect the corporation. A secondary market for a corporation's equity issues is, however, important for the corporation in addition to investors and potential investors.

Baumol\textsuperscript{1} has outlined three essential services of the secondary market.

1. The secondary market imparts liquidity, whereby long term investment can be financed by funds not necessarily provided by long term investors.

2. The secondary market through its price mechanism provides to business management information as to the cost of capital for the company.

3. The secondary market offers an easily understood evaluation of a company's future prospects through the market's price for the company.

In Canada the secondary equity markets are mainly auction markets for stocks listed on exchanges. Stock exchanges are located in Toronto, Montreal, Vancouver, Calgary and Winnipeg but the Toronto Stock Exchange (TSE) accounts for about 68 per cent of the value of trading in Canada. The two Montreal exchanges, the Montreal Stock Exchange (MSE) and the Canadian Stock Exchange (CSE) together account for a further 23 per cent.\textsuperscript{2}


\textsuperscript{2}E.P. Neufeld, \textit{The Financial System of Canada: Its
Investors deal in these markets through brokers who bid for or offer stock on these exchanges. The broker charges his client a commission.

An over the counter market (OTC) also exists primarily in Toronto and Montreal. This market, for the stock of companies not listed on a stock exchange, is maintained by dealers buying and selling from their inventories of particular stocks. Dealers maintain a spread between bid and asked prices for their compensation.

In the United States two further types of secondary markets have developed. These markets, called the third and the fourth market, arose primarily to meet the needs of institutional trading. The third market is an off-board market for exchange listed securities. Dealers in the third market are not members of the New York Stock Exchange (NYSE) but they generally carry inventories of certain NYSE listed stocks and make a market in them much as OTC dealers. These dealers are ready to buy or sell the stock(s) they specialize in and usually quote prices net of any commissions.¹

While a third market as defined above does not exist in Canada, Canadian brokers may deal off the floor in ex-

change listed securities under certain circumstances. For large transactions off the floor trades are allowed where the member has taken a liability position that exceeds $500,000. Such a trade is called a Liability Trade and must be reported to the exchange. When a broker disposes of his liability he must do so at a spread equal to the applicable rate of commission, unless extenuating conditions prevent this. "Liability trades are not to be used as a device to complete trades at less than the minimum applicable rate of commission."¹ The liability trade is seldom used.²

On trades less than $500,000 a broker must deal on the floor of the exchange. Here he has a choice of several methods to follow. He may offer the block³ on the regular auction market, or he may find clients for all or part of the other side and then transact the block trade on the floor of the exchange, or the broker may pick up for his own account the balance or "tail end" of a block of which some portion has been marketed conventionally.

This type of transaction where the broker finds both sides of a trade is called a cross. Brokers try hard to


²Interview with Mr. D. Anthony, TSE, Nov. 7, 1972.

³Here the term "block" means a large number of shares. The term "block trade" is defined below.
carry out crosses whenever possible as they benefit from a commission on both the buy and sell side of the order. That portion of a block which a broker cannot cross is put on the regular auction market, or taken up for his account.

Definitions as to what constitutes a fourth market differ widely and there seems to be little consensus on the street. The authors of the Institutional Investor Study suggest that this term refers only to the practice of institutions dealing directly among themselves. Common usage often has the term refer to institutional trading with the assistance of computerized information networks such as Institutional Networks Inc. ("Instinet"). Strictly speaking here the "Instinet" service is acting like a broker (and charges a commission) in the third market. Defined as suggested by the Institutional Investor Study the fourth market accounts for little activity in the U.S. and in Canada as well.

Large transactions may also be handled by Canadian brokers through Secondary Distributions.


2Ibid., p. 1630.

3Based on interviews with officers of Canadian institutions and brokers carried out as part of this study.
Secondary Distributions

Secondary distributions are classified as either internal or external, and as straight secondaries, or second primary distributions.

Internal secondaries are where a broker distributes to the public a block where his liability exceeds $500,000 and where the selling price to the public is at least equal to the market price plus the regular commission. Such secondaries are carried out off the floor and are considered similar to liability trades.

External secondaries require the approval of the exchange and are carried out where a broker's liability exceeds $250,000 or the amount is such that "... the Floor cannot absorb the stock within a reasonable time at a reasonable price." The Exchanges' rules require that a portion of the distribution, usually 20 per cent, must be offered for sale on the trading floor of Canadian exchanges upon which the stock is listed. The balance of the sale can be made through exchange facilities or entirely off the floor.

Trading large blocks of stock, regardless of the method used, comes under the Securities Act if control of the company is affected. The Ontario Securities Act defines a secondary distribution where the block represents enough

---

shares to "... materially affect the control of such company ..."\(^1\) as a primary distribution and hence requires the filing of a prospectus. Such a distribution is called a "second-primary distribution" in the trade.\(^2\)

Generally speaking few secondary distributions are carried out in Canada. During the period January 1970 to October 1972 there were 29 Secondaries. Of these 6 were second-primary distributions and the balance were external secondaries.\(^3\)

**Special Bids**

Secondary distributions facilitate the selling side of large transactions. On the purchase side a **special bid** may be made. In a special bid a broker acting on behalf of a client makes a bid for a certain number of shares of a stock. This bid and its date is usually announced on the ticker no earlier than five days prior to the bid date and no later than the day before.\(^4\)

Few special bids are transacted; in fact, it is believed that only two have been transacted since the rule

\(^1\)The Securities Act (Ontario) 1966, Section 1, Subsection 16.


\(^3\)Data provided by the TSE.

was introduced in 1968.¹

**Large Transactions**

Large transactions in the secondary market usually take the form of block trades in the regular auction markets or secondary distributions as described above. For secondaries the minimum value traded is usually $500,000 but the exchanges may allow smaller amounts to be distributed as secondaries.

In Canada there is no formal definition for a block trade.² One could arbitrarily define a block as a certain number of shares to parallel the definition of the board lot³ unit of trading, but for our purposes the value of the trade seems to be a more appropriate measure of size, and clearly the value of a fixed number of shares will vary widely depending on the price per share. The problem of selecting a value figure still, however, remains.

The value of issued capital outstanding varies tremendously for individual companies listed on the Canadian exchanges. For example, Industrial Adhesives Ltd. had 400,000 shares outstanding which in May 1972 sold for around $15.00 per share for a total value outstanding of some

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¹Toronto Stock Exchange, Toronto, Ontario, interview with Mr. D. Anthony, Stock List Department, Nov. 7, 1972.

²On the NYSE a block is defined to be 10,000 shares.

³Usually 100 shares, see chapter 3 below.
$6 million. International Nickel, on the other hand, had 74 million shares outstanding valued at over $2 billion. Trading $25,000 of Industrial Adhesives would be regarded as a large trade, whereas $25,000 of International Nickel would not. A block trade could be defined in terms of the per cent of issued capital involved. If we used 1/10 of 1% of issued capital as our figure to define a block, then a $6,000 trade of Industrial Adhesives would be a block trade, while for International Nickel the trade would have to be over $2 million. Clearly, for a typical institutional investor a trade of $6,000 is not a large transaction, while one for $2 million is. Choosing an arbitrary minimum value figure would seem to take the market participant's point of view in defining what is large, but the problem of selecting a minimum value is not resolved.

We must resort to arbitrary procedures. Because the focus of this study is, as explained in the next section, on the institutional investor in the market, a minimum dollar value will be used to define a block. The stock exchanges recognize large value transactions in their commission structure, which allows commission rebates on orders over $100,000 that meet certain requirements.

Under the rules of the TSE and similarly for the MSE and CSE "a volume discount, which is a commission rebate to the client on large sized orders, is permitted pursuant to
orders:

1. placed by one client for one account for the individual security;

2. filled in any trading period of not more than five consecutive days;

3. provided the total value traded during the period is in excess of $100,000, exclusive of commission and tax.¹

It seems reasonable to define, for the purposes of this study, a block trade as one qualifying for a commission rebate. This definition has the operational advantage that details of such trades are reported bi-monthly by exchange members. Hence, since mid 1969, when the commission rebate rule was first applied, data are available on trades meeting volume discount requirements. This definition has the disadvantage that it is arbitrary, and $100,000 could be too small or too large, but some figure must be selected; $100,000 is reasonable and the operational advantages are tremendous.

By way of a summary for this section, Figure 1-1 shows the four types of equity markets discussed above. Each market is classified as to whether it operates as an auction, a negotiated, or a fixed price market and also whether the market deals in large transactions. In each cell where the market (row) has the characteristics designated (column)

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¹Toronto Stock Exchange, Review, August, 1972, p. 60.
FIGURE 1-1
EQUITY MARKETS AVAILABLE TO CANADIAN INVESTORS
IN CANADIAN STOCKS

(Filled cells name the market or instrument corresponding to the row type having the column characteristic.)

<table>
<thead>
<tr>
<th>MARKET CHARACTERISTICS</th>
<th>Auction .Market</th>
<th>Negotiated Market</th>
<th>Fixed price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIMARY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>All established exchanges and OTC market. Typically for large transactions only.</td>
</tr>
<tr>
<td><strong>SECOND MARKET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All established exchanges.</td>
<td>OTC markets</td>
<td>Secondary distributions and primary secondaries, for large transactions only.</td>
</tr>
<tr>
<td><strong>THIRD MARKET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Through US dealers only.</td>
<td></td>
<td>Typically only for large trans.</td>
</tr>
<tr>
<td><strong>FOURTH MARKET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Directly between institutions.</td>
<td></td>
<td>Typically large trans. only.</td>
</tr>
</tbody>
</table>
the actual financial institution, or instrument, is named.

Importance of the Problem
The Trend Towards More Institutional Activity

Since the late 1950's in Canada, and also in the U.S. and U.K., claims on institutions such as banks, pension funds, life insurance companies and mutual funds grew in importance relative to direct holdings of securities by individuals. For example, during the period 1962 to 1970 in Canada, there was a positive flow of funds from the personal sector to such institutions of about $13.6 billion while only $1.1 billion was used in direct personal investment in securities. In fact most of this personal investment was the purchase of Canada Savings Bonds. From the Stock Market there was a net outflow of about $2.1 billion. On the other hand institutional investment in equities increased from $1.5 billion to $9.5 billion.

Reflecting the increased flow of funds from the public to institutions is a corresponding increase in institutional trading. The TSE has carried out periodic surveys to determine the origins of the business transacted by its mem-


2 Ibid., p. 31.
bers. In 1970 (the most recent study) institutional trading accounted for 30.94 per cent of the dollar value traded on the exchange. The corresponding figures for 1968 and 1965 were 26.40 per cent and 20.34 per cent respectively. On the other hand personal investment declined from 40.68 per cent in 1965 to 34.39 per cent in 1970. Table 1-1 shows the breakdown of TSE trading for these years.

**TABLE 1-1**

**TRADING ON THE TSE CLASSIFIED BY ORIGIN OF BUSINESS**

<table>
<thead>
<tr>
<th>Class</th>
<th>1970</th>
<th>1968</th>
<th>1965</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons</td>
<td>34.39%</td>
<td>42.70%</td>
<td>40.68%</td>
</tr>
<tr>
<td>Institutions</td>
<td>30.94</td>
<td>26.40</td>
<td>20.34</td>
</tr>
<tr>
<td>Intermediaries</td>
<td>9.59</td>
<td>9.83</td>
<td>13.51</td>
</tr>
<tr>
<td>Members</td>
<td>25.08</td>
<td>21.07</td>
<td>25.47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>


*bBusiness brokers do on behalf of other, e.g. foreign brokers.*
Trading by institutions on the MSE is thought to be at least as large a percentage of value as on the TSE, because, as shown below, large value transactions tend to be a slightly higher percentage of total value traded, and as about 70% of MSE members are also TSE members, their MSE business can be expected to originate from similar sources. In the U.S., the NYSE reports\(^1\) that institutional trading accounted for over 60 per cent of total value traded in 1970, while in 1960 the figure was less than 40 per cent.

Of course not all institutional trades are large volume trades, nor are all large volume trades carried out by institutions. A trade of more than $100,000 could be on behalf of a wealthy individual investor or for a non-financial corporation.

While for the purposes of this study the origin of large transactions is not a crucial variable, some data are available. The 1968 TSE origin of business study collected data on trading over three one day periods and data on the most commonly traded stocks for a further three one day periods. The 1970 study covered all trades on five randomly selected days. Screening these data for trades over $100,000 revealed the following breakdown.

\(^1\)U.S. Congress, The Institutional Investor Study Vol. 4, p. 1389.
<table>
<thead>
<tr>
<th>Trades by:</th>
<th>Number 1968</th>
<th>Number 1970</th>
<th>% of Total 1968</th>
<th>% of Total 1970</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions</td>
<td>75</td>
<td>148</td>
<td>87%</td>
<td>73%</td>
</tr>
<tr>
<td>Individuals</td>
<td>4</td>
<td>28</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Non-financial Corps.</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Intermediaries</td>
<td>4</td>
<td>24</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85</strong></td>
<td><strong>205</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Data on the value of TSE trading accounted for by large transactions have been available only since the inception of volume discounts (mid 1969). MSE figures are less complete. Despite the short history a marked trend is evident in the following figures.

**Percentage of value of total trading for the period accounted for by trades over $100,000:**

<table>
<thead>
<tr>
<th>Period</th>
<th>TSE(^1) Per Cent</th>
<th>MSE(^2)</th>
<th>ALL CANADIAN(^1) MARKETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969 (July-Dec.)</td>
<td>11.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>14.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>16.0</td>
<td>22.8%</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>17.7</td>
<td>17.8</td>
<td>17.9%</td>
</tr>
</tbody>
</table>

(Secondary distributions account for only a fraction of one per cent of trading in the secondary markets.)

Since 1969, therefore, large transactions on the TSE have increased 47 per cent. These transactions should account

\(^1\)Toronto Stock Exchange, *Review*, January 1973, p. 58. 1972 figures are based on the last 6 months and contain preliminary figures.

for more than $2 billion in value traded for 1972.

Finally the TSE reports that although the daily average value of trading has risen from $5.3 million in 1954 to $18.7 million in 1971 the average daily number of transactions in 1971 is not significantly different from the number of daily transactions in 1954.¹

**Implications of the Increasing Number of Large Value Transactions**

The picture presented above points toward a trend to the antithesis of the perfectly competitive market. The number of large transactions is increasing rapidly while the individual's presence in the market diminishes. It seems reasonable to postulate that in a market dominated by thousands of small investors one would expect widely divergent opinions and varied investment objectives. Here we would expect that individuals buying or selling securities would have no trouble finding the other side.

A market dominated by institutional investors means:

1. That there are fewer participants in the market.
2. Investment objectives are not as likely to differ as much between institutions as between individuals.
3. These investors are more likely to be "expert" investors tending to draw on similar sources of information to reach investment decisions.

The net result of these three factors is that institutions tend to hold the same stocks, and tend to react in the same direction to new market information. There is some debate as to the extent this type of remark is valid. In the literature Gentry\(^1\) has found that institutional investors tend to hold similar portfolios in some industry classes such as Oils and Utilities but do not in Industrials. On the "street" however, there are many reports of institutions acting the same way at the same time with dire results. Fredrick Bleakley, senior editor of *The Institutional Investor*, recently reported on several severe declines in institutional favourites. He quotes the experience of one trader.

Often, in fact the impetus to sell stemmed from the mere presence of a single large sell order. "I received an order to sell 150,000 shares of a stock," reports one trader, "so I made my customary two calls to institutions I knew had been buyers. Wouldn't you know that on the first call I made, the guy shot back, 'if you've got 150,000 to sell you can add 110,000 more'."\(^2\)

Canadian figures indicate a large overlap in institu-


\(^2\)Fredrick R. Bleakley, "Illiquidity Is it Becoming a Problem Again?" *Institutional Investor*, VI, No. 9, (September 1972) 44. (Hereinafter referred to as, *Illiquidity.*)
tional holdings of Canadian stocks. Of the approximately 2,000 publicly traded stocks in Canada:

1,400 were not held by institutions, 1
  600 were held by at least one institution,
  366 were held by at least two institutions,
  122 were held by at least 10 institutions,
  40 were held by at least 25 institutions,
  15 were held by at least 50 institutions,

The largest institutional position was in International Nickel (INCO). Eighty-one funds collectively held 1,743,062 shares of INCO valued (December 30, 1970) at $79.1 million.

Table 1-2 below lists the main Canadian Financial institutions giving their assets as at December 31, 1971, and the approximate number of institutions in each category.

Business Implications:

The data presented below seem to indicate a trend away from the perfectly competitive market. What might this mean for institutions or individuals trading in such a changing market?

From evidence presented below and in Chapter Two there appear to be price effects associated with large transactions. But, before passing judgement we must know more about the nature of such price effects. Two main ideas

1The Financial Post, Survey of Investment Funds, Vol. 10, (1971). These figures are for year end stock holdings in 1970 for mutual funds and trust and life insurance companies' investment funds. There were 182 Canadian funds reporting.
### TABLE 1-2

**CANADIAN FINANCIAL INSTITUTIONS**

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th># of firms</th>
<th>Value of Assets in $ millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered banks</td>
<td>9</td>
<td>$47,308</td>
</tr>
<tr>
<td>Trust companies</td>
<td>60</td>
<td>6,573</td>
</tr>
<tr>
<td>Mortgage and loan</td>
<td>69</td>
<td>3,768</td>
</tr>
<tr>
<td>Credit Unions &amp; Caisse</td>
<td>29</td>
<td>5,207</td>
</tr>
<tr>
<td>Quebec Savings Banks</td>
<td>1</td>
<td>565</td>
</tr>
<tr>
<td>Sales Finance Companies</td>
<td>28</td>
<td>5,493</td>
</tr>
<tr>
<td>Life Insurance Companies</td>
<td>127</td>
<td>19,585</td>
</tr>
<tr>
<td>Fire and Casualty</td>
<td>264</td>
<td>3,078</td>
</tr>
<tr>
<td>Mutual Funds</td>
<td>134</td>
<td>2,690</td>
</tr>
<tr>
<td>Investment Dealers</td>
<td>145</td>
<td>1,742</td>
</tr>
<tr>
<td>Others</td>
<td>?</td>
<td>14,790</td>
</tr>
<tr>
<td><strong>Sub total</strong></td>
<td></td>
<td><strong>$110,799</strong></td>
</tr>
<tr>
<td>Government Financial Institutions</td>
<td>14,316</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$125,115</strong></td>
</tr>
</tbody>
</table>

Source:

a. E.P. Neufeld, *The Financial System of Canada*, p. 574 except for Quebec Savings Banks (p. 164) and Credit Unions (pp. 390-392). The dates for which figures are reported vary between 1968 and 1970. The Credit Union figure is for "Centrals" there are about 4,000 actual member credit unions. The figure for Sales finance companies are only those in the federal organization, there are about 100 others. The figures for investment dealers exclude about 100 who are not members of the I.D.A.

have been proposed, the information effect, and the liquidity payment theories.¹ The information theory states that price changes associated with large transactions reflect the revaluation of a stock in terms of new information available about the stock. In fact the trading of a large block itself is considered as having information content. The liquidity theory states that price variations simply reflect a payment for liquidity services or in effect a marketing expense. The former theory calls for a more or less permanent price adjustment, the latter a short run effect only. Whether or not a price change is short or long lived has important implications.

For example in Bleakley's article² he reports, "Holiday Inns merely reported an earnings dip for 3 months to 39 cents per share (vs. analysts' estimates of about 46 cents), and its shares tumbled from 50 to 40 in one massive trade." Now if the new price holds at the $40 level, ceteris paribus, one can argue that this has become the new equilibrium price for Holiday Inns. If the price soon recovers say to $46 one could then argue that the drop from $50 to $46 represented an adjustment due to the new earnings estimate but that

¹The development of these ideas is traced in Chapter 2 below. See the description of work by Scholes and by Kraus and Stoll. The theories are treated more thoroughly in Chapter 3.

²Fredrick R. Bleakley, Illiquidity, p. 42.
the dip from $46 to $40 was a liquidity cost, a fee paid in return for the quick sale of a large position in Holiday Inns.

Such price effects have important and far reaching implications for institutional investors, brokers and the stock exchanges, and indirectly for a large number of individuals.

For institutional investors several questions present themselves.

1. If institutions, because of their large holdings, must undertake large trades and if such trades involve substantial liquidity charges what will be the effect on the investment performance of the fund?

2. How should funds report their holdings? If liquidity costs are severe the reporting of funds' assets at the market value of their investments may be overstating these assets.

3. If price effects are due to liquidity costs should block trading be carried out in a different type of market where such costs are at least more controllable.

These effects on institutional investors in turn influence a vastly larger number of individuals through their participation in pension funds, life insurance and mutual funds. If the institutionalization of individuals' savings results in diseconomies due to costs associated with trading via large transactions it could be that a net social cost is incurred if such diseconomies are not offset by an improved return on capital invested due to the expert
money management institutions offer.

For brokers and the stock exchange as a whole the question arises as to how well institutional clients are served. Large temporary price effects may imply that the block trading mechanism is not particularly suitable to their needs. Major consequences of this would be the development of specialized block trading markets, such as the third market in the U.S., or an over the counter market for blocks, much as bonds are traded at present. Lesser consequences could result in modifications of the volume discount rules.

Theoretical Implications:

The assumptions of the perfectly competitive market require that the actions of one participant cannot influence market price.

A weaker theoretical model, but one designed specifically to explain the pricing mechanism in the stock exchanges is the efficient market model. This model calls for "a market in which price always 'fully reflects' available information."¹ Under such a model price fluctuations associated with block trading would be expected to be caused by an information effect. This model would predict that

if a block trade had no information content, and if it was not precipitated by any other new information, no lasting price effect would appear.

An interesting offshoot of the efficient market theory is the fact that no mechanical trading rules based on past prices should be able to outperform the market as a whole.\(^1\) Should it turn out that block trades produce short run price effects and assuming it is possible to buy small amounts of a stock at the block price, perhaps a trading scheme of buying a stock just after a block sale, or selling short a stock just after a block purchase, would outperform the market. An examination of this aspect offers an empirical test of the efficient market theory.

Summary

This Chapter began with a description and documentation of the increasing institutionalization of the savings function in Canada. How that trend would manifest itself in the form of large transactions on the Canadian stock markets was considered, and the resultant pressures away from the perfectly competitive market examined.

Next the study's objectives of determining how and why

\(^1\)If prices change only with the arrival of new information about the stock and if the process of new information arrival is random, future price changes will be independent of past price changes. See Michael C. Jensen and George A.
large transactions affect prices and volumes of stocks were enunciated and the problem to be addressed was made more explicit. The terms "large transactions" and "secondary market in equities" were defined as block trades of over $100,000 and secondary distributions traded on or through the facilities of the TSE/MSE. Such trading was found to account for over 17 per cent of value traded in 1972, well up from less than 12 per cent in 1969.

Finally the question of whether price changes due to large transactions, if any, were caused by an information or liquidity effect, was posed and the implications, both practical and theoretical, of each possible cause discussed.

Chapter Two presents an overview of previous empirical work on this and closely related problems.

CHAPTER 2

REVIEW OF PREVIOUS WORK

Canadian Studies

As far as could be determined there have been no published studies of the effects of large transactions on prices in the Secondary market in Canada. Shaw\(^1\) in his doctoral dissertation studied the market for new issues in Canada. This study addressed the primary market for equities, but, a sample of secondary distributions was also included. Shaw calculated the relative performance (relative to the market as a whole) of new equities, and stocks which had undergone secondary distributions or rights issues. Relative performance, which was measured over a long period, tended to be positive after the distribution or rights issue. For the secondary distributions, the only part of Shaw's study directly applicable to the secondary market in equities, short term price impacts of the type to be investigated in this study were not calculated.

U.S. Studies

Some research on the problem has been carried out in the U.S., and the results of three studies have been published. Chronologically, Guthman and Bakay (1965) investigated a sample of 120 primary and secondary offerings. Scholes (1969) examined 345 secondaries made between 1961 and 1965 as well as 609 rights issues between 1926 and 1966. Finally the Securities and Exchange Commission's (SEC) Study for the U.S. Congress examined 7009 block trades on the NYSE and other U.S. exchanges.

While these studies do not confine themselves exclusively to the secondary market their findings are nevertheless applicable and are discussed in detail below.

Guthman and Bakay's Study

Guthman and Bakay (G & B) studied both primary (i.e. a listed public company selling additional stock) and secondary distributions. They examined all transactions

1Harry G. Guthman and Archie J. Bakay, "The Market Impact of the sale of Large Blocks of Stock," Journal of Finance, XX, No. 3, (June 1965), 617-631. (Hereinafter referred to as "Large Blocks of Stock.")


3U.S. Congress, Institutional Investor Study.
over $10 million for their sample. The sample was further subdivided into industrial and public utility issues.

G & B examined price trends for the issues during the eight week period prior to an offering and during the four week period after. The price changes "... were adjusted by using the Standard and Poors' indexes for utilities and industrial common stocks ..."¹ to account for general price trends.

Results are shown in Table 2-1.

G & B concluded that declines for utility offerings were modest and occurred mostly in the four week period prior to the offering. For industrials the price effect was more pronounced, again mostly in the four weeks prior to the offering. For utilities prices recovered within four weeks after the offering but for industrials price declines continued. To explain the differences between the industrial and utility results G & B postulated that investors usually know about financing plans of utilities well in advance and that utilities have expert financial managers able to time new issues so that they result in a minimum of dilution. Industrial corporations they claim, do not.

¹Guthman and Bakay, "Large Blocks of Stock," p. 621. The authors do not say how these adjustments were actually carried out nor do they specify exactly which indexes were used.
### TABLE 2-1

**Market Action of Large Offerings of Common Stock 1949 - 1964a**

(Percentages shown are median figures.)

<table>
<thead>
<tr>
<th>UTILITIES</th>
<th>INDUSTRIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>primary offerings</td>
<td>primary</td>
</tr>
<tr>
<td>Sample size:</td>
<td>56</td>
</tr>
<tr>
<td>% change 8 wks prior to day prior.</td>
<td>-1.6</td>
</tr>
<tr>
<td>% change 4 wks prior to day prior.</td>
<td>-1.3</td>
</tr>
<tr>
<td>% change 8 wks prior to 4 wks after.</td>
<td>-.5</td>
</tr>
<tr>
<td># of issues that rose prior.</td>
<td>19</td>
</tr>
<tr>
<td># of issues that rose after.</td>
<td>36</td>
</tr>
<tr>
<td># of cases with 5% or more price changes prior:</td>
<td>3</td>
</tr>
<tr>
<td>after:</td>
<td>7</td>
</tr>
</tbody>
</table>

*a From results reported in G & B "Large Blocks of Stocks."

**Critique**

Several methodological weaknesses are apparent in this early study. The price movements upon which their conclusions are based, showed a wide dispersion about rather small median values. Also, sample sizes, especially for industrial primaries, were small when contrasted to the long
time period covered by the study. This period covered varying market conditions (through mostly a "bull" market) and adjustment for general market price changes was essential. Some type of adjustment was apparently made but the authors do not describe the method used.

Despite these criticisms G & B's results are consistent with more recent work. The problem of adjusting for changing market conditions is, however, very important and warrants a slight diversion from this review to introduce a powerful method for dealing with it.

**Adjusting for General Market Conditions**

We can easily appreciate the problem that if on examining a large transaction in say stock "A" we found that the price declined two per cent in a four week period prior to the event and two per cent in the four week period after the event, we are tempted to conclude that the trade made a four per cent impact on the price of A. However, if we also know that the whole market, as evidenced by the performance of a composite index, declined three per cent during the period, conclusions about a four per cent price impact on stock A are less valid.

A study of the adjustment of stock prices to new information carried out by Fama *et al.* gives a good descrip-

---

1Eugene F. Fama, *et al.*, "The Adjustment of Stock
tion of how to deal with the effects of general market conditions. The method used by Fama et al. was adopted by Scholes and the SEC, two studies described below.

Fama et al. were examining the reaction of a stock's price to a split. The method used was to look at the return on the stock adjusted for market influences, before and after the split to see if the split made any impact. The rationale for adjustment is based on the assumption that every stock has a "normal" relationship to the market. For each stock in their sample the normal relationship was calculated. The return on the stock and the return on the general market was then monitored around the split date and compared to the normal relationship. Abnormal returns on the stock were deemed to have been caused by investors' reaction to the split.

In simplified one period terms the relationship between the monthly rates of return provided by an individual security and general market conditions is given by:

\[ \ln R = \alpha + \beta \ln M + \mu \]  

(1)

Where: \( R \) = The return on the security for the period.
(Price at the end of the period plus any dividend paid, divided by the price at the beginning of the period.)

M = The return on the market as a whole. (In practice measured by the price change in some representative index.)

α and β = The Intercept and slope coefficients of a linear equation. These are parameters that can vary from security to security and can be thought of as expressing the security's normal relationship to the market.

μ = A random disturbance term assumed to have an expected value of 0, and to be independent of LnM, the time period, and previous values (i.e. serially independent).

The natural logarithmic form of the model is used for a number of reasons.¹ 1) Ln of R and M approximate the rate of return (compounded continuously) for the security and the market. 2) Values of LnR and LnM tend to be more symmetrically distributed than values of R and M which are skewed to the right. 3) Testing by Fama et al. and others has shown that the values conform well to the assumptions of the simple linear regression model.

Once α and β have been estimated for a particular stock equation (1) can be applied to the study period, in this case (the Fama et al. study) 30 months before and 30 months after the split. The residual values (i.e. the values of μ for each period) will tend to be non-zero if there is an effect on prices associated with the event (in this case the split).

The importance of this work to the proposed research

¹Ibid., p. 4.
is the methodology which we shall hereinafter refer to as residual analysis. Results of the Fama et al. study will not be given.

Price Effects of Rights Issues and Secondary Distributions - Myron Scholes' work

Scholes' Ph.D. dissertation¹ was concerned with the effects of large transactions on prices. His main objective was to test the Efficient Market Hypothesis,² and to do so he used residual analysis to study price impacts of 609 rights issues between 1926 and 1966 and 345 NYSE secondary distributions between 1961 and 1965.

Rights Issues

Rights issues can be thought of as a block sale with the important difference that it is the company itself selling the block, usually to investors who are already shareholders. The sellers of these "blocks" are generally


² See Chapter 1, above.
in a good position to time the issue to coincide with favourable investment news. This enables them to get a good price for the issue and to minimize the effects of dilution.

Scholes examined monthly residuals for the period 30 months before (-30) to 30 months after (+30) the rights issue month (0). The cumulative results shown in Figure 2-1 can be thought of as a relative performance index of the stocks with rights issues versus the general market's performance. As expected, we see a definite price appreciation in the period before the issue. During the month of the issue there is a 0.3 per cent drop, while in the period following, no abnormal price trends are in evidence.

A problem in using rights issues is the difficulty in pinning down the date when news of a forthcoming issue was made generally available. Probably this can never be accurately done as many rights issues are anticipated before the formal announcement date. At any rate the time period that investors have to accommodate the news of a forthcoming rights issue is long. The fact that the price drop in month 0 was so small was probably a result of this.

Secondary distributions tend to have associated with them a much shorter advance knowledge period.

Secondary Distributions

A similar analysis for 345 secondaries was carried out. This time the analysis was performed over a period -26 days
to +14 days. SEC rules require some secondaries to be registered\(^1\) before distribution while others are not. Registration must be done at least 20 days before the distribution date. Effectively the process of registering makes the forthcoming distribution public knowledge. Figure 2-2 shows the results in an index form as was done in Figure 2-1.

There is almost a 3 per cent drop in price associated with non-registered secondaries, most of which occurs near day 0. Registered secondaries decline less and the greatest decline is around day -20. Scholes went on to analyze three aspects of these price effects.

To investigate long term effects he performed a monthly residual analysis for eighteen months on either side of a sale. Over 1200 distributions made between 1947 and 1964 were examined. Figure 2-3 of the usual format, shows that the results here were consistent with both the rights issues, (an upward trend in prices before distributions), and with the detailed daily effects, (about a three per cent drop).

Next Scholes examined the relationship between size of sale and price impact during the month of distribution. Size was expressed both as value of the distribution and as a percentage of the value of the company's outstanding

\(^1\)Secondary distributions where control of the company might be affected, for example, must be registered.
FIGURE 2-1

RELATIVE PERFORMANCE OF STOCKS OVER RIGHTS ISSUES

Adopted from Scholes, "Dissertation".

FIGURE 2-2

PRICE IMPACT OF SECONDARY DISTRIBUTIONS

From Brealey, Security Prices, p. 89.
shares. Virtually no association was found.\(^1\)

This result led Scholes to postulate that price drop was not a form of liquidity payment for large transactions, but that investors consider a distribution as being news about a company's prospects. More than likely large sales would be connected with bad news, hence prices drop as investors revalue the corporation's equity. Adding weight to this theory was the lack of price recovery evidenced in Figures 2-1, 2-2 and 2-3.

Scholes was able to test this information content theory further. Of his sample of 345 secondaries, 332 could be classified by vendor as follows:

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment Companies and Mutual Funds</td>
<td>192</td>
</tr>
<tr>
<td>Banks and Insurance Companies</td>
<td>31</td>
</tr>
<tr>
<td>Individuals</td>
<td>36</td>
</tr>
<tr>
<td>Corporations and insiders</td>
<td>23</td>
</tr>
<tr>
<td>Estates and Trusts</td>
<td>50</td>
</tr>
</tbody>
</table>

Now if the information theory holds one could postulate that investors would regard sales by the corporation and its officers as the most significant, whereas sales by trusts and estates, or individuals, would be considered as less significant.

The above hypothesis was tested by plotting relative

\(^1\)A regression for the 345 secondaries of impact \((U_o)\) on the log. of dollar value \((V)\) was:
\[
U_o = -0.0022 - 0.0042\text{LnV} \ ('t' = 0.53, R^2 = .0009).\]
Using percentage of company sold instead of value, produced similar results.
price changes as before. The most significant price drops were found to be associated with secondaries sold by professional investors or insiders. The smallest effects were associated with the non-professionals.

Figure 2-4 shows these results.

Critique

Scholes' work gives support to the theory that price effects associated with secondary distributions are due to an information effect and not a surplus of supply. From a methodological viewpoint his conclusions are well supported. Perhaps the only weakness is the small samples sizes for various vendor categories.

However, the SEC study, discussed below, did not find exactly parallel results when dealing with block trades.

The SEC Study

The SEC Institutional Investor Study was a major empirical undertaking covering many aspects of institutional activity and culminating in a report of seven volumes containing more than 6,000 pages. Jones¹ has summarized some of the key points of this study. The price impacts of block trading is dealt with in Chapter XI but the two researchers

FIGURE 2-3
LONG TERM PRICE IMPACTS OF SECONDARY DISTRIBUTIONS

\[
\text{Relative price change (\%)}
\]
\[
\text{Month relative to distribution}
\]

\[a\text{From Brealey, Security Prices, p. 86.}\]

FIGURE 2-4
PRICE IMPACTS OF SECONDARIES BY VENDOR

\[
\text{Relative price change (\%)}
\]
\[
\text{Month relative to distribution}
\]

\[a\text{From Brealy, Security Prices, p. 90.}\]
responsible for this section of the study, Alan Kraus and Hans Stoll (K & S) have recently published their findings in the *Journal of Finance*.<sup>1</sup> This article covers all the important empirical work done for this section of the SEC study and adds no more; it does however expand on the theoretical basis of the research and on implications of the findings. For this reason further reference to the SEC study will be made in the context of the K & S article.

K & S incorporated a similar methodology to that used by Scholes in analyzing price impacts for 20 days before and 20 days after 7,009 block trades. A "block" on the NYSE is any transaction of more than 10,000 shares, but the analysis in the study was carried out mainly on those trades of more than $1 million in value. The sub-sample of trades over $1 million consisted of 2,197 trades. These trades were further classified as being "sells" or "buys" on a basis of the difference in price between the trade and the most recent board lot trade (the "tick"). A "plus tick" is when the block moves at a price higher than the previous trade and is deemed to be a buy. "Minus ticks," on the other hand, are classified as sells. The sub-sample contained 1,199 minus ticks and 366 plus ticks (there were 630 "zero ticks", i.e. no price difference).

<sup>1</sup>Allan Kraus and Hans R. Stoll, "Price Impacts of Block Trading on the New York Stock Exchange," *Journal of Finance*, XXVII #3 (June 1972) 569-588. (Hereinafter referred to as "Price Impacts of Block Trading.")
Day of Block Results

The price impact occurring within the day the block traded was first analyzed. In the case of minus ticks the price of the stock declined from the closing price the day before to the block price, and then recovered about one half the drop by the close on the day of the block. For plus ticks prices rose from the close the day before to the block price, but then remained up, with only a slight drop to the close. Table 2-2 presents these intra day price impacts.

TABLE 2-2

Average Percentage Price Difference Between Selected

Prices in the period Day -1 to close at Day 0

<table>
<thead>
<tr>
<th></th>
<th>PLUS TICKS</th>
<th>MINUS TICKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close day -1, to trade</td>
<td>+0.75%</td>
<td>-0.72%</td>
</tr>
<tr>
<td>before block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade before block</td>
<td>+0.75%</td>
<td>-1.14%</td>
</tr>
<tr>
<td>to block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block to close day 0.</td>
<td>-0.09%</td>
<td>+0.71%</td>
</tr>
<tr>
<td>Net change close day -1</td>
<td>+1.32%</td>
<td>-1.10%</td>
</tr>
<tr>
<td>to close day 0 adjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for market changes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

K & S argue that the .71% recovery in price for minus tick blocks supports the payment for liquidity theory,\(^1\) which they called the distribution effect hypothesis.

\(^{1}\text{Ibid., p. 576.}\)
This recovery means that, on average, buyers of blocks saved a bit more than one commission. Sellers on the other hand paid an extra commission.

**Cumulative 41 Day Results**

Looking at the full 41 day period (day -20 to day +20) a price performance index similar to Figures 2-1 to 2-4 was plotted. Figures 2-5 and 2-6 show these results.¹

Both these plots imply a relatively permanent price change supporting Scholes' information effect hypothesis.

**Relationship of Price Effect to Dollar Value of Block**

K & S next regressed the price impact (\( U_0 \)) on day 0 against the value of the block (\( V \)) getting the following relationships.

<table>
<thead>
<tr>
<th>Type of Block</th>
<th>Intercept</th>
<th>Value Coef.</th>
<th>&quot;t&quot; value</th>
<th>( R^2 )</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minus Ticks</td>
<td>-.767</td>
<td>-.129</td>
<td>7.26</td>
<td>.042</td>
<td>1199</td>
</tr>
<tr>
<td>Plus Ticks</td>
<td>+.951</td>
<td>+.131</td>
<td>2.72</td>
<td>.020</td>
<td>366</td>
</tr>
</tbody>
</table>

In contrast to Scholes' results K & S find what they claim to be a significant relationship. The magnitude of this relationship would on average imply for an increase of $1 million in block size a price effect increase of 0.13 per cent.²

---

¹ Figures 2-7 and 2-8 are from *ibid.*, pp. 580-581.

FIGURE 2-5
PRICE IMPACT FOR 1121 MINUS TICK BLOCKS

FIGURE 2-6
PRICE IMPACT FOR 345 PLUS TICK BLOCKS
Other Tests

Two further tests on these data were undertaken by K & S. The first test was to see if blocks which were not followed by additional blocks, (called trailing blocks) and leading blocks (i.e. those not preceded by other blocks) behaved differently.

Defining a trailing block as one followed by no other blocks over $1 million for 10 days resulted in samples of 591 minus tick blocks and 150 plus tick trailing blocks. Results for plus ticks were as before (i.e. a positive price impact which did not subsequently decline. For trailing minus tick blocks prices tended to recover. This test also found no tendency for minus tick blocks to cluster whereas there was a tendency for plus tick blocks to cluster.

The second of these tests was addressed to the perfect market hypothesis and investigated whether or not there was any serial dependence between price changes the day before and the day of the block. While the perfect market hypothesis would predict no dependence a slight positive dependence was found. K & S thought this result too inconclusive to repudiate the perfect market hypothesis and felt it was probably caused by a difference in the timing of price impacts for various blocks.¹

¹Ibid., p. 585.
Table 2-3 shows, in summary form, the six tests performed by K & S and the results vis-a-vis the information effect and distribution effect hypotheses. For example, the measuring of price impacts is designated test number one in column one of the figure. Opposite this, under columns two and three the predicted outcomes of the test are given. For test one, if the information hypothesis is true (column two) we would expect to find permanent price effects for both plus tick blocks and minus tick blocks. If the distribution hypothesis holds (column three) then temporary price effects are expected. Column four gives the actual results that K & S discovered. For test one they found permanent price effects for plus and minus tick blocks, a finding that lends support for the information hypothesis.

Critique

The empirical work of K & S is impressive. Sample sizes were large, the analysis rigorous and detailed. Conclusions drawn were not however strong, for as shown in Table 2-3 there was no uniformity of test results supporting either of the two competing hypotheses. Nor are the results too useful in describing block trading in general on the NYSE. It will be recalled that the SEC study group collected data on 7009 block trades but all of the reported analysis is based on only 1565 blocks over $1 million. Again this sample was only partially random as it was purposely
### TABLE 2-3

**SUMMARY OF KRAUS AND STOLL'S ANALYSIS**

<table>
<thead>
<tr>
<th>TEST</th>
<th>PREDICTIONS OF ...</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Information</td>
<td>Distribution</td>
</tr>
<tr>
<td></td>
<td>Hypothesis</td>
<td>Hypothesis</td>
</tr>
<tr>
<td>1. Price Impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plus ticks</td>
<td>Permanent eff.</td>
<td>Temporary effect</td>
</tr>
<tr>
<td>Minus ticks</td>
<td>Permanent eff.</td>
<td>Temporary effect</td>
</tr>
<tr>
<td>2. Intra Day Impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plus ticks</td>
<td>Permanent eff.</td>
<td>Temp. effect</td>
</tr>
<tr>
<td>Minus ticks</td>
<td>Permanent eff.</td>
<td>Temp. effect</td>
</tr>
<tr>
<td>3. Relation of price impacts to value traded</td>
<td>No relationship</td>
<td>Positive relationship</td>
</tr>
<tr>
<td>4. Recovery of trailing blocks</td>
<td>Some possibil. of a recovery for plus &amp; minus ticks as less info. imp.</td>
<td>Rapid recov.</td>
</tr>
<tr>
<td>Plus ticks</td>
<td></td>
<td>Rapid recov.</td>
</tr>
<tr>
<td>Minus ticks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Clustering of blocks</td>
<td>Blocks should cluster</td>
<td>Blocks should cluster</td>
</tr>
<tr>
<td>6. Serial Independence(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plus ticks</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Minus ticks</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

\(^a\)Really a test of the Perfect Market Hypothesis.
chosen to include a disproportionate number of trades in stocks involved in mergers, etc.

Summary: Information Effect or Liquidity Costs?

In this chapter we have examined the somewhat sparse field of past research into large volume transactions. Only one suitable study (Scholes) was found dealing with secondaries. Again only one (the SEC/K & S study) suitable study of block trading was found.

On the theoretical side, two reasons why large value transactions may cause price impacts have been suggested. Interestingly, the two principal studies reviewed come to opposite conclusions as to the underlying causes of price impacts. Scholes argues that price impacts are due to an information effect causing a permanent adjustment of prices. This was confirmed empirically when it was discovered that prices dropped but did not recover. K & S studied both block sales and purchases. For purchases an information effect was again found but for sales it appeared that price impacts reflected a liquidity cost.

K & S, being the later study, partially reconciled their position by claiming that differences in applying commission charges on secondaries meant that liquidity costs were covered by high commissions whereas for block trades standard commissions were usually applied, hence the
extra liquidity cost was reflected in a price impact.\textsuperscript{1} This theory was, it was claimed, empirically borne out by the quick price recovery on the day of the trade and the positive relationship between price effect and value of trades.

While conclusions reached are different, results of the two studies are really only marginally different. Table 2-4 below has been designed to present the three tests common to both studies in a manner such that a quick comparison of results and conclusions may be made.

In the next chapter a theoretical model is developed to explain how the underlying mechanism of price adjustment in the stock market may be influenced by large value transactions.

In addition to price effects, an explanation of potential effects on volume will be incorporated. It is hoped that this model will produce testable hypotheses powerful enough to shed new light on the problem.

\textsuperscript{1}Ibid., p. 587.
**TABLE 2-4**

A Comparison of Results and Conclusions

Scholes vs. Kraus & Stoll

<table>
<thead>
<tr>
<th>TEST</th>
<th>RESULTS</th>
<th>CONCLUSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scholes</td>
<td>K &amp; Sa</td>
</tr>
<tr>
<td>Price recovery</td>
<td>.2%</td>
<td>.7%</td>
</tr>
<tr>
<td>on day of block.</td>
<td>recov.</td>
<td>recov.</td>
</tr>
<tr>
<td></td>
<td>on .7%</td>
<td>on 1.8%</td>
</tr>
<tr>
<td></td>
<td>dropb</td>
<td>drop</td>
</tr>
<tr>
<td>Impact index over time</td>
<td>perm.</td>
<td>perm.</td>
</tr>
<tr>
<td></td>
<td>change</td>
<td>change</td>
</tr>
<tr>
<td>Relation between pr. impact &amp; value</td>
<td>val.</td>
<td>val.</td>
</tr>
<tr>
<td></td>
<td>coef.</td>
<td>coef.</td>
</tr>
<tr>
<td></td>
<td>.0042</td>
<td>2.132</td>
</tr>
<tr>
<td></td>
<td>t=.53</td>
<td>t=7.26</td>
</tr>
<tr>
<td></td>
<td>R^2=.0009</td>
<td>R^2=.042</td>
</tr>
</tbody>
</table>

a Results are for sales (minus ticks) only.

b Interpreted from his results.
CHAPTER 3

THEORETICAL DEVELOPMENT

Introduction

In this chapter we begin by developing the demand curve for a single stock in the secondary market. Next, the effective supply curve, which buyers of the stock face is developed, along with the effective demand curve faced by sellers of the stock. The discussion then centers on how these supply and demand curves lead to price determination for board lot trades and then for large value transactions. This gives us a jumping off point for the development of a theoretical model to explain how large transactions might influence prices of a stock in the secondary market.

Conventional demand and supply theory is not readily applicable to the secondary stock market for two reasons. First of all there is no clear-cut distinction between buyers and sellers, for in the secondary stock market the same market participants are, at times, both buyers and sellers of a stock. This contrasts sharply with the usual economic example where producers are always sellers and consumers always buyers of a particular economic good. Secondly, the supply of the stock is perfectly inelastic.
Supply is simply the amount of issued equity capital that the particular corporation has outstanding, an amount which is, except in the long run, fixed as long as we are dealing with transactions in the secondary market for equities.

**Demand Curve for a Single Stock**

Despite the problems raised above we can construct demand and supply curves for a stock and examine the pricing mechanism. Williams\(^1\) is credited with the most succinct exposition of this development, which is followed here.

For any particular stock at any particular time some participants in the market can be expected to hold opinions as to the stock's intrinsic worth. These opinions are, however, likely to be quite different and we can speak of a distribution of opinion. Figure 3-1 illustrates such a distribution. The curve shows that a few people feel the stock is worth $100 (nobody thinks it is worth more than $100) while many people think it is worth $40, and nobody thinks it is worth less than $20. On the "Y" axis of Figure 3-1 the number of shares to which people ascribe the "X" axis values, are plotted. The area under the curve represents the number of shares outstanding (say 500,000) and while $40 is the most commonly held opinion of the

stock's intrinsic value (the modal value) we cannot say the stock will be traded at that price in the market. Figure 3-2 shows Figure 3-1 in what is essentially a cumulative form.

The "X" axis of Figure 3-2 shows the number of shares that would be held at prices greater than the various prices shown on the "Y" axis. The curve stops abruptly at line SS which represents the total number of shares outstanding. The price at which the 500,000th share was purchased is $20. The last purchaser is referred to as the marginal purchaser and the price of this last transaction becomes the market price.

In economic terminology line SS is the perfectly inelastic supply curve for the stock, and line DD is the demand curve for the stock.

**Effective Supply and Demand Curves for Buyers and Sellers**

From Figure 3-2 we can construct an "effective supply" curve for a potential investor in the stock.

Reproducing Figure 3-2 as Figure 3-3 below we can measure, at any price, the number of shares which investors think are worth more than that particular price, and more important, the number of shares considered to be worth less than that price. At $30 for instance, line AB indicates that investors feel 200,000 shares are worth less than $30
FIGURE 3-1
FREQUENCY CURVE OF INVESTOR OPINION

Number of shares to which X values are ascribed.

Y

X

Estimated true value of the stock ($)

FIGURE 3-2
DEMAND CURVE BASED ON OPINION FROM 3-1

Price per share ($)

Y

S

D

X

Number of Shares (X1,000)
while investors speaking for 300,000 shares (500,000-AB) consider the worth of the stock to be more than $30 per share. If a potential investor bids $30 per share for the stock he might expect to receive 200,000 shares and $30 would become the new marginally determined market price.

Figure 3-4 illustrates the effective supply curve made up by transposing the distance from SS to the demand curve DD (i.e. lines parallel to AB) at various points.

An effective demand curve can also be developed, but with less certainty, than in the supply curve case. This is because for a supply curve stocks can only be bought from those investors who already hold the stock. It would be theoretically possible to tap these investors' opinions and formulate a supply curve. For the demand curve holders of the stock can sell to anyone, hence the value opinions of potential purchasers is not known and would seem to be a difficult thing to determine. We can, however, be assured that if stock was available there would be investors willing to buy it at prices under $20. In Figure 3-3 this hypothetical extension of demand curve DD is shown as DD'.

The line CE in Figure 3-3 measures the number of shares which could be sold at $15 per share. In Figure 3-4 the effective demand curve is constructed by transposing measurements parallel to CE as was done for the supply curve.

Figure 3-4 shows the supply and demand curves that investors or potential investors face. The intersection
FIGURE 3-3
EFFECTIVE SUPPLY AND DEMAND CURVES

Price per share ($)

0 10 20 30 40 50 60 70 80

0 200 400 600

Number of shares (X1,000)

FIGURE 3-4
SUPPLY AND DEMAND CURVES

Price per share ($)

0 10 20 30 40

0 200 400

Number of shares (X1,000)
of these curves (at $20) determines the market price for
the stock. The distance between lines SA and DB in Figure
3-4 can be thought of as the bid-asked spread which is shown
as a function of the number of shares to be traded. The
rationale for this assumption and possible alternatives will
be examined below, but before going to that stage it is wise
to stop and critically examine the area around the intersec-
tion of SA and DB, and the method of determining the bid-
asked spread in the retail or board lot market.

The Bid-Asked Spread in the
Retail (board lot) Market

Conventionally the bid-asked spread is based on the
smallest unit of trading. In Canada this is called a board
lot and is usually 100 shares but the number of shares de-
creases as the value of the shares involved increases. A
board lot is seldom worth more than $3,000.¹ An actual
market price is only in existence as a trade takes place.

¹Board lots on the TSE are, with a few exceptions,
as follows:

Mines and Oils:
Stock price less than $1.00 - 500 shares
Stock price over $1.00 - 100 shares

Industrials:
Stock price under $25.00 - 100 shares
Stock price $25 to $100 - 25 shares
Stock price $100 and over - 10 shares

When no trade is taking place the market price for a particular stock consists of a price(s) bid by a potential buyer(s), and a price or prices offered by a potential seller(s). The difference between these two prices is called the "bid-asked spread", or simply the spread.

In practice there are two types of orders that investors can place in the stock market, market orders and limit orders. A market order is placed by an investor who desires execution as soon as possible, while a limit order specifies a price above which the investor will not buy the stock, or for sales, a price below which he will not sell. The expression "buy at $20 or better" means buy at any price $20 or less and is a limit order. A market order to sell is usually matched with the highest limit order available (the bid) while a market order to buy is cleared at the lowest asked price, if the number of shares coincide.

Figure 3-5 shows a blow-up of the area circled in Figure 3-4. The situation depicted is where there is no actual trade and the market is represented by a bid for up to 300 shares at $19 7/8 and an offer of up to 400 shares at $20 1/8. This would mean that there are investors who have placed limit orders which total 300 shares wanted at $19 7/8 or less and 400 shares ready to sell at $20 1/8 or more. Notice that in Figure 3-5 the bid-asked spread tends to increase for orders involving fewer than 100 shares. This trend reflects the added cost of dealing in less than board
FIGURE 3-5

RETAIL BID-ASKED SPREAD

Price per share ($)

20 3/8 S
20 1/8
20
19 7/8
19 5/8 D

Number of shares
0 100 200 300 400 500

A
B
lot units (called odd-lot trading).

After 300 shares there are no more bids at $19 7/8 but presumably some investors have limit orders to buy at prices below $19 7/8, while after 400 shares, presumably some sell orders exist at prices above $20 1/8. Thus the bid-asked spread can be expected to widen as the number of shares increase. West and Tinic\(^1\) develop a similar relationship, although they start from an exchange theory point of view. As long as trades are for small multiples of board lots the market price is expected to remain roughly between the bid and the asked prices. As existing limit orders are filled new ones are expected to arrive at, or near, the same price as long as there is no cause for investors to revalue the basic worth of the stock.

The Bid-Asked Spread in the Institutional (Large Trades) Market

Extrapolating lines DB and SA in Figure 3-5 produces Figure 3-4 again. Here we can see that large transactions will cause wide price fluctuations even though the market price remains within the bid-asked spread. The extent to which the price can be expected to fluctuate depends upon assumptions made about the slope of the curves in Figure

3-4. The length of time the market price remains distorted depends on the arrival frequency of orders for the stock, and the interpretation investors put upon the price changes themselves. It must be remembered that retail bid-asked spreads as indicated in Figure 3-5 are known quantities. Bid and asked prices for board lots are quoted continuously, but institutional bid-asked spreads as shown in Figure 3-4 are not known, and we can only speculate as to their magnitude.

From the above analysis we can be reasonably sure that most transactions and especially large transactions will take place at a price different from the stock's intrinsic worth as established in Figure 3-2. We have discussed how retail trades tend to be executed at the bid or asked prices, which are respectively lower and higher than the intrinsic market price. We have also seen how this situation is exacerbated as order size increases. There are, however, other factors that force an institution to buy or sell a stock at a price different to its intrinsic market price.

Five sources of pressure tending to move actual prices away from the market price are listed below, and then each is discussed in turn.

1. Transaction costs, i.e. fees, commissions, taxes etc.

2. Liquidity costs.

3. Temporary imbalances of supply or demand due to the timing or arrival of orders in the exchange.
4. Temporary imbalances of supply or demand due to large orders.

5. Imbalances of supply or demand due to new information entering the market.

Transaction Costs

The organized exchanges provide a central market place where buyers and sellers of securities can get together. This in itself is a valuable service for without the exchange organization investors would have a hard time finding people to deal with if each individual fended for himself. A second valuable function of the organized exchange, or at least its broker-members, is the function of gathering and disseminating information as to the market value of traded securities.

To compensate the brokers, customers pay a commission calculated as a percentage of the dollar value of the transaction plus a small fixed fee. Minor transfer taxes are also part of the transaction costs.¹

For our purposes the important feature is that this commission structure is not based on any factor other than the value of an order, and except for the volume discount

¹ Other authors, notably Harold Demsetz, "The Cost of Transacting," Quarterly Journal of Economics, LXXXII (Feb. 1968) 33-53, define transaction costs to include commissions etc., plus a liquidity cost as measured by the bid-asked spread. This definition is not adopted here as the measurement of liquidity costs for large transactions is not so straightforward. Demsetz (ibid., p. 40) found that commissions etc., accounted for 60 per cent of total transaction costs while liquidity costs accounted for the remaining 40 per cent.
schedule it is applied on almost a fixed percentage basis. These charges are, unlike the four other price effects listed above, independent of market conditions. As we can expect commission charges to be applied more or less evenly across the board for all institutional trading,\(^1\) they are incorporated directly into our model.

Figure 3-6 below illustrates the effective percentage charge for one side of a transaction. The rate varies with the price per share of the stock. Figure 3-7 graphs the reduction available under the volume discount rules. These discounts are expressed as a percent of the commission indicated in Figure 3-6.

**Liquidity Costs**

Tinic\(^2\) has dealt at length with the concept of liquidity cost, and has developed a two-component definition.

> From a general exchange point of view liquidity refers to the ease of exchangeability. In modern

---

\(^1\) Of course this is somewhat naive. Brokers often give special services to particular institutions, e.g. fund performance analysis, in exchange for "soft dollars" (commissions). Also, commissions on any order over $1/2 million are negotiable. (That is the commission on the amount over $1/2 million is negotiable. On the first $1/2 million the normal commission, less volume discounts if applicable, is levied.)

FIGURE 3-6

COMMISSIONS AS A PER CENT OF VALUE OF TRADE

(Based on TSE commission plus Ontario transfer tax for orders of 100 shares at the prices shown.)

FIGURE 3-7

EFFECTIVE COMMISSION REDUCTIONS UNDER THE TSE/MSE VOLUME

DISCOUNT RULES

Comm. on portion over $500K is negotiable
markets, liquidity is defined as the ability to effect an exchange of assets into money. The convenience or ease or exchangeability is measured in terms of (1) the waiting time involved in disposing of the asset and (2) the difference between the price received and the prevailing market price.¹

For example, a person who wishes to sell a house usually has a choice between asking a "low" price and selling the house quickly, or asking a "high" price and waiting for a willing buyer to come along. All other things being equal, it is better to wait. But all other things are not equal, for the house owner who waits incurs the additional costs of maintaining and operating the house as well as the opportunity cost of having his capital tied up for the additional period of time. For an institutional investor the same applies. Trading quickly involves taking the bid-asked spread as it is. Waiting for the other side could reduce the bid-asked spread, but there is an inventory cost to waiting.

From the above analogy we should expect liquidity costs to be directly related to both waiting time and the bid-asked spread. But, the price spread would be expected to be inversely related to the waiting time. Figure 3-8, which is in three parts, illustrates these relationships. Part A depicts the relationship between liquidity costs and waiting time. The longer the waiting time the higher the

¹Ibid., p. 20.
liquidity costs due to carrying the stock. Price spread also directly influences liquidity costs as shown in part B of Figure 3-8. This component of liquidity cost is the difference between the market price and the amount paid or received. Finally in part C the inverse relationship between waiting time and price spread is depicted.

The objective function for an institution desiring to minimize liquidity costs (LC) could be:

Minimize LC:

\[ LC = W_t \times W_c + N_s \times P_s \]  \hspace{1cm} (3.1)

Where: \( W_t \) = waiting time
\( W_c \) = waiting cost
\( N_s \) = number of shares
\( P_s \) = price spread per share.

Temporary Imbalances of Supply and Demand
Due to Timing of Arrival of Orders

If an order to sell a particular stock "at the market" arrives in the exchange, that order is usually executed at the current bid price. The new bid then becomes the round lot purchase order nearest in price to the old bid. Should a succession of market orders arrive all on the same side (in our example all sells) they would successively fill the highest standing order, then fill the next highest order and so on gradually reducing the bid. In this temporary situation there is no reason to expect the asked price to be lowered as news of the selling pressure would have little time to reach the present offerers of stock (we
A. Liquidity cost versus waiting time

B. Liquidity cost versus price spread

C. Price spread versus waiting time
consider only very short run effects). Figure 3-9 illustrates how the bid-asked spread would widen with a short run imbalance of supply. The market price is determined by the intersection of Sm and Dm. Bid and asked prices (Pa and Pb) are determined by the intersection of the supply and demand curves of those who stand ready to execute an exchange immediately at the limit order price, (Si and Di). A temporary excess in supply can be illustrated by a shift to the right of the supply curve (dashed curve St). This produces a new bid of Pb'.

It seems certain enough that temporary imbalances of supply and demand will cause price movements. The question is do such imbalances actually occur?

Niederhoffer and Osborne\(^1\) in an analysis of over 10,000 NYSE transactions did not find any evidence of buy or sell orders clustering. In fact their findings indicated that an upward price movement was more likely to be followed by a price movement down than anything else. Smidt on the other hand has stated "Temporary imbalances of supply or demand are more the rule than the exception."\(^2\) It is not

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FIGURE 3-9

EFFECT OF AN IMBALANCE OF SUPPLY ON

THE BID-ASKED PRICE SPREAD

Price per share ($)

Number of shares
clear whether Smidt is referring to institutional trading only, or to supply and demand imbalances caused by new information about the security, or to genuine non-random arrivals of buy and sell orders. He does refer to the second alternative further on in his article.

The conventional mythology is that a large volume of transactions from individual investors is a primary source of market liquidity. There is an element of truth in this belief to the extent that some individuals will be buying while others will be selling. However, temporary surges of buying and selling orders from individual investors in a particular stock seem to occur more frequently than is generally realized. These surges of orders from individual investors probably result from reports in newspapers, magazines, wire house sheets and other widely circulated media. Whether or not such reports contain genuine news, they are likely to attract attention to an issue and increase the volume of trading in it. Since individuals frequently utilize market orders, and since they cannot easily be aware of how many others of their kind are reacting in the same way, at the same time, to the same bit of mass media information, they are particularly likely to find that their sell order has been executed in the midst of a temporary excess of supply, while their buy order was executed while there "happened" to be a temporary excess of demand.1

The whole weight of the efficient market evidence2 would discount the possibility of any price movements due to imbalanced supply or demand that was not accounted for

1Ibid., pp. 19-20.

by new information. To salvage something from this type of price movement it does seem fair to say that the narrowness of the bid-asked spread is directly related to the trading activity in a particular stock. This statement which has been empirically verified\(^1\) is tantamount to saying that the sequence of order arrivals is less likely to be out of balance if trading activity is high. Or, if activity is low but order arrivals are balanced, time lags between orders is such that limit orders are placed further from previous transactions to reduce waiting costs.

**Imbalances of Supply and Demand Due to Large Orders**

When an order several hundred times the standard unit order reaches the floor we can be fairly sure a temporary imbalance of supply or demand will result. In the Canadian markets no structural units equivalent to the NYSE specialist exist, hence a large order must be transacted through many fills,\(^2\) unless the broker has previously (off the floor) found all or part of the other side and crossed\(^3\) the order.

---

\(^1\) Demsetz in "The Cost of Transacting" and Tinic in "Liquidity Costs," present results supporting this.

\(^2\) An analysis of 212 trades over $100,000 from the trading information for five randomly selected days in 1970 revealed that 85 orders were completed in one fill while the balance took more than one fill averaging about 9 fills per order with a range of 29 fills.

\(^3\) See Chapter 1 for a definition of a crossed trade.
A large sell order should "knock out" (fill) all the bids down to the price of the block offer, then the block will "overhang" the market absorbing any bids at the block price. Graphically such a process would be analogous to the drop in bid price shown in Figure 3-9, above.

Again we would anticipate that trading activity would affect both the degree to which the price dropped, and the length of time the block overhangs the market.

Imbalance of Supply and Demand
Due to the Arrival of New Information

This final cause for a shift in prices follows from circumstances that differ from the four cases previously considered.

When new information\(^1\) that in some way materially affects (or at least some investors perceive it to) expectations about future prospects for a company, that company's equity will be revalued. This revaluation will most likely result in a new equity price being established in the secondary market, but it is possible that there would simply be a realignment of investors' portfolios with no price change.\(^2\)

---

\(^1\)The question of what is information is answered in a tautological way by stating that if anyone thinks it is information, it is!

\(^2\)This idea is developed in; William H. Beaver, "The Information Content of Annual Earnings Announcements," Empirical Research in Accounting: Selected Studies 1968, Suppl. Vol. VI of Journal of Accounting Research, 67-92. See pages 69-70. (This article is hereinafter referred to as "Information Content".)
Figure 3-10 shows how a new equilibrium price ($P_1$) will result when new information reaches the market. The figure depicts the arrival of unfavourable news which results in a downward shift of the demand curve (D) to $D_1$, resulting in a price drop $P$ to $P_1$. The important point here is that the demand curve shifts while the bid-asked spread need not, and probably does not, change.¹

Theoretically price changes of this nature should be independent of market and transaction variables, such as market activity or value of the order, for what is important is the information content of the news. This reasoning is probably valid but one can argue that activity is a good proxy for how investors perceive the information content of the news. The problem gets further complicated when one realizes that unusual activity such as a block trade is itself likely to be regarded as news, especially if details of the participants involved are known.²

A Mixed Model

The five methods of price movement discussed above need not operate on a mutually exclusively basis. In fact,

¹In Tinic's results the spread was independent of the security's price. (Tinic, "Liquidity Costs," pp. 86-118). In Demsetz work price was a significant independent variable. (Demsetz, "The Cost of Transacting," pp. 47-49.)

²See the discussion of Scholes' work in Chapter 2.
FIGURE 3-10
REACTION OF A STOCK'S MARKET PRICE TO NEW INFORMATION

Price per share ($)

Number of shares held  Total outstanding
with the exception of process three, it seems reasonable to postulate a model where all the processes act together to influence price changes. Process three which was the imbalance of supply and demand due to clustering of buy and sell orders may actually be compounded in information effects, process five.

Changes in price between what is considered to be the present market and what an institution transacting a large purchase or sale will pay or receive can be expressed as the following functional relationship.

\[
\text{Change in Price} = \int \text{(Transaction costs, Liquidity costs, Excess demand or supply, Change in information.})
\]

- or in symbols:

\[
\Delta P = \int (TC, LC (\Delta S|\Delta D), \Delta I)
\]

(3.2)

The first independent term (TC) is a function of the value of the transaction (Val).

\[
TC = \int (Val)
\]

(3.3)

Liquidity cost (LC) from equation (3.1) is a function of waiting time (Wt) and price spread (Ps).

\[
LC = \int (Wt, Ps)
\]

(3.4)

but:

\[
Wt = \int (Vol) \text{ (see page 70 above)}
\]

and:

\[
Ps = \int (Vol, \# \text{ of share holders [Ns], Val}) \text{ (from Demsetz)}
\]

(3.6)

therefore:

\[
LC = \int (Vol^2, Val, Ns)
\]

(3.7)
Where: The term $\text{Vol}^2$ doesn't really imply the square of the volume but rather the superscript is chosen to imply that the term volume appears two times in the component equations. This notation will be continued.

The excess supply and demand is a function of activity, value of the trade, and the time taken to trade. Here activity is measured by volume ($\text{Vol}$) and the time taken to trade is measured by the number of days the trade took ($\text{Dys}$).

\[ \Delta S \text{ or } \Delta D = \int (\text{Vol}, \text{Val}, \text{Dys}) \quad (3.8) \]

New information is functionalized in a less satisfactory way as it involves investor perceptions and expectations. Suffice it to say that new information effects ($\Delta I$) are a function of investor perceptions ($\text{Per}$) of what constitutes news and investor expectations ($\text{Exp}$) as to the importance of this news.

\[ \Delta I = \int (\text{Per}, \text{Exp}) \quad (3.9) \]

Substituting equations 3.3, 3.7, 3.8 and 3.9 into equation 3.2, and using the same superscript notation as above, we get:

\[ \Delta P = \int (\text{Vol}^3, \text{Val}^3, \text{Ns}, \text{Dys}, \text{Per}, \text{Exp}) \quad (3.10) \]

The last two terms of (3.10), $\text{Per}$ and $\text{Exp}$, are clearly far from quantifiable. Rather than deal directly with the problem, volume impacts can be considered as a proxy for investor sentiment. The rationale behind this is the economist's notion that volume reflects a lack of consensus
regarding the price.\textsuperscript{1} A lack of consensus is induced by the arrival of new information which is interpreted differently by different investors. Such a lack of a consensus is most probable immediately before the arrival and just after the arrival of new information. Beaver goes on to say\textsuperscript{2}:

If consensus were reached on the first transaction, there would be a price reaction but no volume reaction, assuming homogeneous risk preferences among investors. If risk preferences differ, there still could be a volume reaction, even after the equilibrium price had been reached.

An important distinction between the price and volume tests is that the former reflect changes in the market as a whole while the latter reflects changes in the expectations of individual investors. A piece of information may be neutral in the sense of not changing the expectations of the market as a whole but it may greatly alter the expectations of individuals. In this situation, there would be no price reaction, but there would be shifts in portfolio positions reflected in volume.

Thus we would expect normal volumes both before and after the block trade to be evidence of a clear consensus as to the importance of the information involved. A longer lasting volume impact would imply investor uncertainty as to the information content. For example, if a price impact quickly recovers but abnormal volume persists we would say that the trade had information content associated with it but investors did not all perceive it as of equal importance. If the price impact did not recover but volume did, we would

\textsuperscript{1}Beaver, "Information Content".

\textsuperscript{2}Ibid., pp. 69-70.
conclude that the market has, with few dissenters, established a new equilibrium price for the stock, hence a high level of information content was associated with the trade.

The term number of shareholders (Ns) is also not a particularly suitable variable as its inclusion is based on the results of a study (Demsetz's) that did not explicitly involve institutional trading. Number of institutional shareholders is what we really need, or better still a classification scheme as to whether or not a particular stock block trades actively or not. Such a classification is available.\(^1\) Hence we can replace the term Ns with a term (Ia) to represent institutional activity in the particular stock.

Incorporating the above modifications we can rewrite equation (3.10) as:

$$\Delta P = \int (\text{Vol}^4, \text{Val}^4, \text{Ia}, \text{Dys})$$  \hspace{1cm} (3.11)

**Summary**

Chapter 3 began with a systematic development of institutional supply and demand curves. From these curves

---

\(^1\)This scheme and the resultant classification for TSE/MSE stocks was presented in: Nicholas Close, "Block Trading on the Montreal and Toronto Stock Exchanges", to be published in the proceedings of the 1972 Association of Canadian Schools of Business. (Hereinafter referred to as "Block Trading".) The classification is discussed in Chapter 5 below.
and other considerations five possible factors to account for the price effect of large volume transactions were isolated. Price impacts were considered to be a function of four of these influences, namely: transaction costs, liquidity costs, imbalance of supply and demand due to large orders and fundamental price changes due to new information. By expressing these four influences in their functional parts and simplifying we were able to express price impacts as a function of:

1. Value of the order.
2. Volume of trading in the stock.
3. Number of days the trade took.
4. Institutional interest in the stock.

In Chapter 4 we develop a set of testable hypotheses designed to explore the interrelationships in the model described by equation (3.11) above.
CHAPTER 4

STATEMENT OF THE RESEARCH HYPOTHESES

This Chapter develops a set of hypotheses that specify how the four independent variables (volume, value, institutional activity, and time taken to trade) of equation 3.11 might be expected to affect price impacts. The study essentially tests one principal hypothesis, which can be stated in the null form as:

PRINCIPAL HYPOTHESIS:
There are no discernible price effects associated with large value transactions in the secondary market for equities in Canada.

From the empirical research described in Chapter 2 we have grounds to expect not one but two alternative hypotheses. Hence, rather than testing the principal hypothesis directly we formulate three "main hypotheses" to cover the null and the two alternative hypotheses. These hypotheses are presented in an empirically testable form below. From each of the main hypotheses four related hypotheses designated as "auxiliary hypotheses" are generated and discussed.
Main Hypothesis One (H1) "The Substitution Effect"

Under Hypothesis One, which can be called the "Substitution effect" hypothesis, to parallel Scholes'\textsuperscript{1} terminology, investors are assumed to be concerned with a portfolio of risky assets, not with a particular stock per se. This means that many stocks are substitutes for each other. The market will price assets so that the expected rates of return are similar for assets of similar risk. Even a very small deviation by a particular security from the equilibrium price for its risk class will be quickly eliminated.

H1 implies that transaction costs are the only costs associated with large transactions, and as such, trading large value blocks of a stock does not differ materially to the trading of board lots. Transaction costs will not be reflected in market prices hence; we can succinctly state H1 as:

H1: LARGE TRANSACTIONS IN A PARTICULAR STOCK WILL NOT PRODUCE ANY DISCERNIBLE IMPACT ON THE MARKET PRICE OF THAT STOCK.

H1 leads to important implications concerning the pricing mechanism in the stock market. Hypothesis 1 being true would imply that there are no extra charges for liqui-

\textsuperscript{1}Myron S. Scholes, "The Market for Securities," p. 181.
dity services (other than commission charges) associated with large transactions. Clearly these implications are contrary to the conventional wisdom of "the street" which holds that there are only a few stocks in Canada that can be traded in large values without the price "running away".¹ The theoretical basis to H1 is the perfect market hypothesis discussed in Chapter 1. For investors to act in a way that would lead to quick substitutions among various investments requires firm convictions among market participants as well as a lack of institutional restrictions on investment choices.

In terms of supply and demand this means that excess supply (in the case of a sale) is quickly met by a buildup of demand as soon as the price of the stock begins to drop. The demand comes from investors who recognize that an investment at the lower price offers an expected rate of return in excess of that for securities of a similar risk class. This new demand quickly bids the stock's price back up again.

A second possibility that might be more consistent with professional views is that if H1 is true it could be because investors dealing in the Canadian market are simply

unwilling to trade unless they can do so at the market price. Operationally it would appear that large trades do not affect the market price when in fact there are many frustrated traders in the market who would like to trade, but feeling unable to trade at the market, do not trade. In view of the large number of block trades that do take place (cf. Chapter 1 above) this explanation is somewhat doubtful. A more probable version could be that traders, while unwilling to take large price differentials, avoid doing so by actively seeking the other side of the transaction before putting the trade on the floor. This could lead to a large number of block trades with little effect on price.

Main Hypothesis Two (H2) "The Price Pressure Effect"

H2: LARGE TRANSACTIONS IN A PARTICULAR STOCK ON THE SECONDARY MARKET WILL PRODUCE TEMPORARY CHANGES IN THE MARKET PRICE OF THAT STOCK.

In the short run, trading a large block of stock will have a temporary effect on price because even though willing buyers or sellers exist, it is difficult to find them in sufficient quantity. To induce investors to buy/sell these securities, the party initiating the trade must offer a price incentive.\(^1\) On a sale, for example, the seller would

\(^1\)Ibid.
have to offer his stock at a price less than the equilibrium price. The higher rate of return offered to potential buyers of the now lower priced stock will induce them to purchase the stock.

Hypothesis Two predicts that block trades will cause a short term price movement away from the equilibrium price, but not a change in the equilibrium price. Also, H2 implies that an investor must pay a premium or take a discount when dealing in a large transaction, and that this premium or discount is reflected in a temporary movement away from the market price. The price difference between the transaction price and the market price is considered as payment for the liquidity services rendered in moving a larger than normal block. This type of price effect is more commonly expected on the street. The important feature is that the effect is only a very temporary one, that is to say one would expect only the large transaction to be carried out at a price significantly different from the market price. Trades in the particular stock prior to, and after, the block trade would be expected to be carried out at a price very near the market price.

An interesting test of the efficient market hypothesis presents itself should H2 be true. Any price movement of a predictable nature begs the question. Can an investor (or trader) make money by developing a purely technical rule? Under H2 a technical rule could be designed to take
advantage of the drop in price after a block purchase or the rise in price after a block sale. Assuming that it is possible for a trader to deal in small amounts of a stock at or very near the block price a rule could be made as follows. Immediately after a block sale, buy the stock selling it again when the price recovers, or for block purchases, immediately after the block sell the stock short closing the short position after the price drops. The extent of the price deviations and the costs of trading will determine the rule's profitability. It is unlikely that an investor who must pay full commission charges could profitably follow such a rule, but exchange members trading for their own accounts incur only very modest charges and it is possible that they could take advantage of the situation. The effect of many traders following the rule would tend to decrease the time required for prices to recover and hence lessen the opportunities to use the rule.

Main Hypothesis Three (H3) "The Information Effect"

H3: "PERMANENT" CHANGES IN A PARTICULAR STOCK'S EQUILIBRIUM PRICE ARE EXPECTED TO BE ASSOCIATED WITH LARGE VALUE TRANSACTIONS IN THAT STOCK

This hypothesis states that a block trade has new information content,¹ and as such, one can expect the market

¹Here the term information has the same broad cono-
to revalue the stock to the extent that expectations about future income streams are revised. The direction of the price effect will, of course, depend on the type of information deemed to be contained in the transaction. Any changes in price will be a fundamental change in the equilibrium price and thus would be "permanent". For example, if block sales are associated with unfavourable news a permanent decrease in price would be expected.

The information effect hypothesis, if it is the correct explanation, will be identified in the market by a longer lasting price effect than for H2. We would expect that price premiums or discounts would appear in conjunction with large value transactions but after the large trades in question we would not expect the market price of the stock to return to prior levels. In fact the question of causality is not easy to resolve. If some new information, independent of the large trade, becomes known to the market we would expect to see a readjustment of market price regardless of whether or not large value trades took place. But on the other hand, it is possible that the large transaction is regarded as significant news in the market and then the transaction itself becomes the cause of the revaluation. Most likely a combination of these two possibilities could be expected, hence we would expect to see a reaction as it did when discussed in Chapter 3.
price adjustment beginning prior to the large value transaction and continuing after the transaction.

The nature of these three main hypotheses suggests a direct way of testing to determine which hypothesis best explains the predominant underlying mechanism. The three hypotheses are competing and in the most simple form they predict that price effects will be either non-existent, temporary or permanent, hence a plot of price impacts similar to those plotted in Figures 2-7 and 2-8 in Chapter 2, should indicate which hypothesis best holds. Figure 4-1 illustrates the three patterns of price impacts which would be expected under each of the hypotheses.

As is evident in Figure 4-1 the "pure cases" are easily distinguishable one from another but should a price impact index plot fall somewhere in between the characteristic lines shown above it would be very hard to determine the dominant underlying process. The three competing hypotheses are not mutually exclusive. In order to distinguish clearly between the three choices we must develop a set of additional or auxiliary hypotheses. The basis for these hypotheses is the model developed in Chapter 3.

For each of the three main hypotheses we will generate four auxiliary hypotheses relating price impacts to the value of the transaction, the time the transaction takes to trade, whether or not there is a lot of institutional activity in the stock and finally the effect on the daily
FIGURE 4-1
PRICE IMPACTS EXPECTED UNDER THE THREE MAIN COMPETING HYPOTHESES

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<tr>
<td></td>
<td>0.98</td>
<td></td>
</tr>
</tbody>
</table>

Day       | -10 | -5  | 0   | 5   | 10  |
------------|-----|-----|-----|-----|-----|
SALES       |     |     |     |     |     |
PURCHASES   |     |     |     |     |     |
trading volume of the stock produced by, or associated with, the large transaction.

**Auxiliary Hypotheses Under Main Hypothesis One**

If the substitution hypothesis is true and stocks are in fact good substitutes for each other, then the extreme case should be made that any price effects should be independent of the value of the transaction (expressed either in absolute dollar terms or in terms of percent of outstanding value traded). Perhaps a more reasonable view would be that the larger the trade the fewer the substitutes available simply because there is a definite value of stock outstanding. This rationalization would lead one to expect a positive relationship between price impact and value of trade. Accordingly our first auxiliary hypothesis which we can designate as H1A1 is:

**(H1A1) THERE WILL BE NO DISCERNIBLE RELATIONSHIP BETWEEN THE VALUE OF A LARGE TRANSACTION AND THE ASSOCIATED PRICE IMPACT.**

Under the Canadian volume discount rules a transaction need not take place via only one particular transaction or indeed on one particular day but is allowed to be filled over a period of up to five consecutive trading days. One could postulate that a trade which is transacted via numerous fills over a period of several days would have a
different price impact than a trade that was consummated in one transaction. The substitution effect hypothesis would not predict any difference on the grounds that large transactions are not expected to make any price impact anyway. Accordingly:

(H1A2) THERE SHOULD BE NO RELATIONSHIP BETWEEN THE TIME A LARGE TRANSACTION TAKES TO TRADE AND THE ASSOCIATED PRICE IMPACT.

The third independent variable in the model is the level of institutional interest in a particular stock. Under H1 the fact that a particular stock has a large or a small institutional following should not influence price impacts associated with large value trading in the stock. This is because any slight deviation away from a stock's established intrinsic value will be quickly eliminated by individuals in the case of stocks with little institutional following and by institutions and individuals in the case of stocks followed by the institutions. There should be no reason to expect either of these two processes to be more or less efficient than the other. The next auxiliary hypothesis is then:

---

1This measure will be described in detail and operationally defined in Chapter 5.
(H1A3) THERE SHOULD BE NO RELATIONSHIP BETWEEN THE INSTITUTIONAL INTEREST IN A PARTICULAR STOCK AND THE PRICE IMPACTS ASSOCIATED WITH LARGE VALUE TRANSACTIONS IN THE STOCK.

Finally it is useful to consider volume effects. So far all the hypotheses proposed have nil or almost nil predicted outcomes under H1. Fortunately we can expect more interesting results for volume. The substitution hypothesis mechanism is based on process that quickly reduces any potential price impact to an undetectable size. If this process is actually at work it should result in an increase in the volume of trading in the particular stock on and near the day of the transaction. Of course the very fact that large value transactions are necessarily large volume transactions means that volume will automatically be higher than normal on the day of the transaction but owing to the substitution trading we would expected a volume impact over and above the impact caused by the transaction itself. This abnormal volume would, however, be of short duration only.

(H1A4) VOLUME IMPACTS ASSOCIATED WITH LARGE VOLUME TRANSACTIONS SHOULD BE GREATER THAN THOSE DUE TO THE TRANSACTIONS THEMSELVES AND OF SHORT DURATION.
Auxiliary Hypotheses Under Main Hypothesis Two

Under the price pressure hypothesis one can logically postulate that the greater the value involved in the transaction the more difficult it would be to find the other side of the trade. This should result in larger price discounts or premiums being offered. Accordingly the first auxiliary hypothesis relating to H2, following the previous convention, can be designated as H2A1:

(H2A1) AS THE VALUE OF LARGE TRANSACTIONS INCREASES,

THE PRICE IMPACTS ASSOCIATED WITH THE TRANSACTIONS ARE EXPECTED TO INCREASE.

Time taken to trade should, under H2, have a tempering effect on the associated price impact because the longer a particular bid or offer is outstanding in the market the more likely it is to be filled. Liquidity cost as described in Chapter 3 is a function of time preferences, as well as price spread. The longer the waiting time, the less the expected price spread (see Figure 3-8C). For large transactions we would then expect smaller price impacts to be associated with trades that took a longer time to execute.

(H2A2) AS THE TIME TAKEN TO TRADE INCREASES THE PRICE IMPACTS ASSOCIATED WITH LARGE TRANSACTIONS ARE EXPECTED TO DECREASE.

Institutional activity should have a similar effect
to that expected for time to trade under the price pressure hypothesis. Here we would postulate that the presence of a large institutional following in a particular stock would enhance the chances of attracting enough buyers or sellers, as the case may be, to complete the other side of the transaction. Accordingly:

(H2A3) PRICE IMPACTS FOR STOCKS WITH A LARGE INSTITUTIONAL FOLLOWING SHOULD BE LESS THAN PRICE IMPACTS ASSOCIATED WITH STOCKS NOT HAVING A LARGE INSTITUTIONAL FOLLOWING.

The final auxiliary hypothesis under H2, concerns volume effects. Here the theory calls for no abnormal volume. The large transaction itself would generate higher volume than is usual for the particular stock on the day(s) that the trade is executed but there are no grounds to expect any volume effects over and above this.

(H2A4) THERE SHOULD BE NO VOLUME IMPACT ASSOCIATED WITH A LARGE TRANSACTION IN A PARTICULAR STOCK OTHER THAN THE IMPACT DUE TO THE TRADE ITSELF.

Auxiliary Hypotheses Under Main Hypothesis Three

Main Hypothesis Three is the information effect hypothesis. Basically under this hypothesis any price effects are expected to be due to the information content
of the trade or to the information associated with the
transaction and not directly due to the trade itself inter-
facing with the market mechanism. Auxiliary hypotheses
concerning value, time, and institutional activity lead to
predictions similar to those under H1. Predictions about
volume effects are, however, different.

Unless information content is directly related to the
value of a trade, a proposition for which there is little
a priori evidence, one would not expect price impacts and
the value of the transaction to have any relationship under
the information effect hypothesis. Thus we can state
auxiliary hypothesis 1 under H3 as:

(H3A1) THERE SHOULD BE NO RELATIONSHIP BETWEEN THE
PRICE IMPACT ASSOCIATED WITH A LARGE TRANSACTION
AND THE VALUE OF THAT TRANSACTION.

By similar reasoning to the above we should not
expect any relationship between the time taken to trade and
the resultant price impact, for there are no grounds to
support the contention that there is more or less informa-
tion associated with trades that take relatively longer or
shorter times to trade. Perhaps, however, it is reasonable
to postulate that the longer the time taken to trade the
more broadly the information associated with the trade will
be disseminated. Should that be the case a positive relation-
ship would be expected, namely long duration trades would
be expected to produce larger price impacts. H3A2 then becomes very much like H1A1.

(H3A2) THE RELATIONSHIP BETWEEN THE TIME TAKEN FOR A LARGE TRANSACTION TO TRADE AND THE ASSOCIATED PRICE IMPACT WILL BE POSITIVE BUT WEAK IF DISCERNIBLE AT ALL.

Under H3 we would not expect any relation between the degree of institutional activity in a particular stock and the price impact. Once again this is because it is the change in information about the stock that leads to a revaluation of the stock's intrinsic worth and hence to a change in the market price. One can argue that the process of information dissemination may vary depending on the institutional interest in a stock, the idea being that large investors are more apt to have more resources committed to information gathering. This would lead to faster and presumably more accurate reappraisals of a stock's worth. In terms of the observed price impacts, those for stocks with a high institutional following would be expected to reach a new market price quickly and remain at the new level. Stocks with little institutional following, on the other hand, might be expected to reach their new equilibrium price over a period of several days and the new price may fluctuate somewhat representing a lack of investor consensus. Despite the above, Hypothesis H3A3 will be stated in the pure form of the information hypothesis, that is:
(H3A3) THERE SHOULD BE NO RELATIONSHIP BETWEEN THE INSTITUTIONAL INTEREST IN A PARTICULAR STOCK AND THE PRICE IMPACTS ASSOCIATED WITH LARGE TRADES IN THE STOCK.

The final hypothesis, H3A4, concerns the relationship between volume impacts and the information hypothesis. Under H3 we would expect investors to change their portfolios in line with changing opinions as to a stock's intrinsic worth. Hence we would expect a volume impact over and above that due to the size of the large trade alone. Also, and most important, the increased activity would be expected to last for a few days after the trade as the readjustment process is gradually carried out. This final auxiliary hypothesis is most important in differentiating H1 from H3 for the first three auxiliary hypotheses yield the same expected results under either of these main hypotheses.

(H3A4) VOLUME IMPACTS ASSOCIATED WITH LARGE TRANSACTIONS IN A PARTICULAR STOCK SHOULD EXCEED THOSE EXPECTED FROM THE TRADE ITSELF AND THE IMPACTS SHOULD LAST FOR A PERIOD LONGER THAN THE TRADING PERIOD

Summary

This chapter has presented 15 hypotheses, three of which have been classified as "main hypotheses" describing
three competing explanations for price effects associated with large value trading of a particular stock. The 12 secondary or "auxiliary" hypotheses, as they have been called, deal with expected relationships between price impacts and; value of trades, time taken to trade, institutional interest in the stock and the associated volume impacts.

The main hypotheses suggest that price impacts are due to one of three mechanisms, namely: 1) A substitution effect whereby investors quickly substitute stocks as soon as prices move from the established equilibrium price, thus leading to very small impacts if any. 2) The price pressure hypothesis which states that investors dealing in large value transactions must offer a premium or take a discount as a payment for liquidity services to move a large block of stock. 3) The information effect hypothesis which states that it is not the large trade itself but the information associated with the trade that leads investors to establish a new intrinsic value for the stock in the market.

Under each of these main hypotheses four auxiliary hypotheses were developed that predict various relationships between price impacts and our four independent variables. Table 4-1 presents the results predicted by each auxiliary hypothesis. Each row of the 4×3 table represents one
independent variable while the three columns represent the main hypotheses. In each cell the relevant auxiliary hypothesis is given in code number form and the prediction for the row variable under the column hypothesis is given.

Chapter 5 presents a methodology to empirically test the 15 hypotheses developed above.
**TABLE 4-1**

*Predictions Under Auxiliary Hypotheses*

(Each cell shows the predicted relationship between the row independent variable and the price impact under the column hypothesis.)

**MAIN HYPOTHESES**

<table>
<thead>
<tr>
<th>INDEPENDENT VARIABLE</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Substitution</td>
<td>Price Pressure</td>
<td>Information</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>1 Value of Trade</td>
<td>H1A1</td>
<td>H2A1</td>
<td>H3A1</td>
</tr>
<tr>
<td></td>
<td>Nil</td>
<td>Positive</td>
<td>Nil</td>
</tr>
<tr>
<td>2 Time taken to trade</td>
<td>H1A2</td>
<td>H2A2</td>
<td>H3A3</td>
</tr>
<tr>
<td></td>
<td>Nil</td>
<td>Negative</td>
<td>Nil</td>
</tr>
<tr>
<td>3 Institutional activity</td>
<td>H1A3</td>
<td>H2A3</td>
<td>H3A3</td>
</tr>
<tr>
<td></td>
<td>Nil</td>
<td>Negative</td>
<td>Nil</td>
</tr>
<tr>
<td>4 Volume Impacts</td>
<td>H1A4</td>
<td>H2A4</td>
<td>H3A4</td>
</tr>
<tr>
<td></td>
<td>Positive impact of short duration</td>
<td>Impact equal to value of trade only</td>
<td>Positive impact of several days duration</td>
</tr>
</tbody>
</table>
CHAPTER 5

DATA SAMPLE AND METHODOLOGY

This chapter describes the sampling plan used to collect data on a large number of block trades and provides a detailed overview of the analytical methods that will be used to test the 15 hypotheses described in Chapter 4. Common to all the analysis will be a three-way examination of price impacts. First, one day price impacts will be studied. These are based on the intra-day price changes from the close on the day before the large transaction, to the price at which the trade took place, to the close on the day of the trade. Next, daily price impacts will be calculated on a basis of close to close price changes for a period 15 days before to 15 days after a large trade. ¹ Finally a price impact index will be calculated over the 31 day period. These three tests will be carried out on a large number of large value transactions and an attempt will be made to determine which of the three main hypotheses is best supported. The three tests will then be repeated on various subsamples of the data base to test the 12 aux-

¹The choice of this particular time period is explained below.
iliary hypotheses.

Data Availability

A necessary starting point for the analysis described in this chapter is a large sample of data on actual block trades and secondary distributions. Information concerning the stock traded, the date(s) of the trade, the value of the trade and the price at which it was transacted is required for each transaction.

Data on secondary distributions are collected by the TSE for all external secondaries where the facilities of the exchange are used. ¹ A member broker is required to file a copy of the notice announcing the secondary with the stock list department of the exchange. Also a copy of any prospectus issued in connection with the secondary distribution is required.

Block trades are reported via the volume discount report, a report required monthly from each member of the TSE and MSE. This report is designed to monitor the amount of business that is eligible for the commission rebate on orders over $100,000, and contains information as to the stock traded, the value of the trade, the date of the first and last fills in the order, the amount of the trade that

¹See Chapter 1 for a description of the various types of secondary distributions.
was crossed and the name of the broker. This report has been available since mid 1968, and in its present form since late 1969.

**Sampling Plan**

From the eighteen month period (December 1969 to May 1971) nine two week sample periods were selected, and data were collected on all block trades in those nine periods. The total sample is comprised of four and one half months' block trades, or 25% of the total time period. Half month sampling periods were used because:

1. Brokers report on a bi-monthly basis and this represents a logical time limit.

2. These periods are short enough to enable one to clearly identify market conditions during the period.

These nine periods were selected so as to sample the available time period and on a basis of general market price and volume trends at the time. The nine periods represent unique combinations of price levels rising, flat and falling while volume was high, medium and low. For the condition, "prices stable" for example, there are three samples each with a different volume condition. For "prices rising" there are a similar three samples and the same for "prices falling".

The TSE Composite Industrial Index was used as a proxy for general price and volume levels. Volume is classified as follows:
High Volume - Over 500,000 shares traded almost every day of the period. (The actual average daily volume for these samples was 571,000 shares.)

Medium Volume - Over 500,000 shares traded on about one-half of the days of the period. (The actual average daily volume for these samples was 483,000 shares.)

Low Volume - Few or no days with volume over 500,000 shares. (The actual average daily volume for these samples was 373,000 shares.)

A volume of 500,000 shares traded in the stocks making up the TSE Industrial Index generally corresponds to a total TSE volume of 2.5 million shares. Days on which volume exceeds 3 million shares are considered high volume days while days below 2 million shares are considered low volume days.

Price trends were determined by visual inspection of a plot of the TSE Industrial Index. Graphs of the Index as reported in the TSE Monthly Review were utilized and the trend for the two week period in question determined. These trends were confirmed by reference to the actual index values. For the condition prices rising, the actual percentage increase in the Index over the two week periods averaged 2.8%. The average for prices falling was -4.3% while for prices flat the average price change was 0.0%.

Figure 5-1 outlines the sample periods chosen on a basis of the characteristics described above. Selecting these 9 unique conditions from 36 possible time periods means that some periods fit the conditions better than others and the differing market conditions are, of course, only on a short
**FIGURE 5-1**

**BLOCK TRADING SAMPLING PLAN**

(Showing sample selection based on market conditions and sample selection as distributed over the total possible time period.)

<table>
<thead>
<tr>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
</tr>
<tr>
<td>Up</td>
</tr>
<tr>
<td>Flat</td>
</tr>
<tr>
<td>Down</td>
</tr>
</tbody>
</table>

**Time**

<table>
<thead>
<tr>
<th>Period</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>'69</td>
<td>J</td>
<td>F</td>
<td>M</td>
<td>A</td>
<td>M</td>
<td>J</td>
<td>A</td>
<td>S</td>
<td>O</td>
</tr>
<tr>
<td>1970</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'71</td>
<td>J</td>
<td>F</td>
<td>M</td>
<td>A</td>
<td>M</td>
<td>J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
term basis.

While the sampling procedure is not random it is felt that controlling for market conditions and covering most of the available time span offers advantages that outweigh this feature. In addition the sample is large both absolutely (over 3,000 trades) and in relation to the population (about 25%) which enhances the plausibility that it is a representative sample.

Reports generated by all members of the TSE and by members of the MSE who were not also members of the TSE, were collected for the nine periods shown in Figure 5-1. These reports were supplied by the respective stock exchanges.

In total data on 3,199 transactions were collected, which after culling out preferred issues, warrants and uncorrectable errors, was reduced to 3,006 transactions valued at $593,972,097.

Price Data

Daily price, volume and dividend data for a period before and after each transaction are also required before price impact calculations can be carried out. The data requirements here are quite voluminous. To calculate 31 daily price impacts for a single block trade requires 32 daily prices and volumes for the stock and 32 daily price and volume levels for the index as well as split and dividend information. This totals some 130 observations per trade, or theoretically 390,000 data items would be required to
calculate price and volume impacts for 3,000 large value transactions. Fortunately such data are available on a direct access basis through the Financial Research Institute (FRI) in Montreal. Accordingly, the large value transaction data bank has been converted to machine readable form and stored in a direct access mode compatible with the FRI data. For a few of the stocks in the block trading sample adequate daily price histories were not available. This factor further reduced the number of trades in the large value transaction sample to 2,900 accounting for $584,822,913 in value traded.

METHODOLOGY

Calculation of Price Impacts

A three step process leads to the determination of a price impact for a particular trade. Step one involves classifying block trades as either buys or sells (secondary distributions are, of course, all sells). Step two is the removal of general market influences from the price history of the stock immediately around the date of the large transaction. Step three is the actual price impact calculation. These three steps are detailed sequentially below.

Step 1: Buy/Sell Classification

As the price effects of a block trade would be expected to be in opposite directions depending on whether the instigator of the trade was a buyer or a seller, it is
necessary to determine the buy/sell status of each block trade. In the SEC study, data on the price of the trade preceding the block were available, and trades were classified on a basis of the "tick" (see Chapter 2).

The tick information is not readily available in Canada, and important differences in the definition of a block trade make it a less appropriate measure for Canadian data. The definition of a block trade adopted here (see Chapter 1) allows trades to be completed over a period of up to five consecutive trading days. In the U.S. a block trade is only one transaction. The use of a tick basis of classification is dubious for trades that take place over a period of time.

Additionally, classifying trades as buys or sells on a basis of the price movement in the stock leads to a potential bias in the price impact results. For example, if trades that took place on an uptick are classified as buys, and the average price movement on the day of a block is calculated for many buys, so classified, it is inevitable that the average price movement, at least for the day of the block, will be up.

For the Canadian data each trade is classified as a buy or a sell by the broker reporting the transaction. By examining the trading pattern for each stock it was possible to determine, for most trades, whether the broker's classification was correct for the active side of the trade. A
series of examples will clarify this scheme.

1. In many cases only one block trade in a particular stock on a particular day would be reported. In this case it would be assumed that the other side of the trade was a series of smaller non block trades, hence the reported block would be considered the active side and the broker's classification accepted.

2. In other cases one large block trade would be reported as, say, a buy, while two or more smaller blocks in the same stock on the same day would be reported as sales. Here the single large trade would be considered the active side and the status of the smaller trades changed from sales to buys.

3. A further possibility was one large trade classified as, say, a buy and one smaller trade in the same stock on the same day classified as a sale. In this case the larger trade would be deemed the active side, and the status of the smaller trade changed.

Of the 2,900 trades in the data bank it was possible to classify 2,526 trades on this basis. The 374 trades not classified were the case where two trades of exactly the same amount were reported for a particular stock on the same day, and one trade was designated a sale and the other a buy. Most of these cases were crossed trades.

To classify these 374 remaining trades, a surrogate of the tick method was used. Where the price of the block exceeded the closing price for the stock the day before, the trade was considered as a buy. Conversely if the block price was less than the previous close the trade was considered to be a sale. It was possible to classify 290 of these trades on this basis. The 84 trades not classified all meet the condition of the block price being the same as
the previous close. These were considered to be zero ticks; that is, neutral trades.

A test was made to determine how closely the two methods of classification paralleled each other. From the data 307 randomly selected trades which had previously been classified by the first method were reclassified by the second (price) method. The two methods agreed on the classification of 188 (61%) of the trades and disagreed on 67 (22%). Fifty two trades were classified as zero ticks. The test indicates that the two methods are fairly compatible and on the strength of this all 2,900 trades were classified, 2,526 by the first method and 374 by the price method.

The results of this classification are listed below.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buys</td>
<td>1,644</td>
<td>$ 325,320,576</td>
</tr>
<tr>
<td>Sells</td>
<td>1,172</td>
<td>240,292,800</td>
</tr>
<tr>
<td>Zero ticks</td>
<td>84</td>
<td>19,209,537</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>2,900</td>
<td><strong>$ 584,822,913</strong></td>
</tr>
</tbody>
</table>

**Step 2: Adjusting for Market Influence**

Simply put, the whole object of calculating price impacts for a large number of large value transactions is to determine how much the price of a typical stock fluctuates when a block of that stock trades. To do this one could look at the daily change in price of the stock for a number of days before the block trade, the day of the trade and several days after the trade. This would be done for
all trades classified as sells and the changes aggregated to produce the typical price impact for a sale. In the same way the typical price impact for buys would be calculated.

Unfortunately, the price impacts of individual trades and hence aggregate results, could be biased by changes in general market price levels over the period sampled. Hence the "general market" influence must be removed from daily change data.

The market model first suggested by Markowitz,\textsuperscript{1} developed by Sharpe\textsuperscript{2} and first used in this way by Fama et al.\textsuperscript{3} was used by both Scholes and the SEC (see Chapter 2) for this purpose. The model relates the return\textsuperscript{4} for a particular stock in a particular time period, to the return for the market in general, for the same time period. The market return can be approximated by measuring the return on a representative index such as the TSE Industrial Index.\textsuperscript{5}

\textsuperscript{1} Harry M. Markowitz, \textit{Portfolio Selection: Efficient Diversification of Investments}, (New York: John Wiley & Sons, 1959), pp. 96-100.


\textsuperscript{3} Fama et al. "The Adjustment of Stock Prices to New Information," (This study is discussed in Chapter 2.)

\textsuperscript{4} Return = price at end of period + any dividends paid during the period, divided by the price at the beginning of the period.

\textsuperscript{5} Both Scholes and the SEC used Standard and Poor's composite index of 500 securities.
The model can be stated as:

\[ R_{it} = \alpha_i + \beta_i R_{mt} + U_{it} \]  \hspace{1cm} (5.1)

Where: 
- \( R_{it} \) = The return for stock \( i \) in period \( t \).
- \( R_{mt} \) = The return for the market in period \( t \).
- \( \alpha_i \) = An intercept coefficient for stock \( i \).
- \( \beta_i \) = A slope coefficient for stock \( i \).
- \( U_{it} \) = An error term for stock \( i \) in period \( t \).

Here \( \alpha_i \) and \( \beta_i \) are parameters which must be determined for each stock \( (i) \) and together represent the stock's normal relationship to the market. The final term \( (U_{it}) \) has impounded in it returns not accounted for by the general market return. Once the parameters \( \alpha_i \) and \( \beta_i \) are known we could predict, on the basis of any price change in the market, a price change for the security. The error predicted for that period would be:

\[ E_{it} = R_{it} - (a_i + b_i R_{mt}) \]  \hspace{1cm} (5.2)

Where \( E_{it} \) = The estimated prediction error for stock \( i \) in period \( t \).
- \( a_i \) = The value estimated for \( \alpha_i \).
- \( b_i \) = The value estimated for \( \beta_i \).

We can define the return on stock \( i \) for period \( t \) and the return on the market in period \( t \) as:

\[ R_{it} = \ln \frac{P_{it}}{P_{it-1}} + D_{it} \quad \text{and} \quad R_{mt} = \ln \frac{I_t}{I_{t-1}} \]  \hspace{1cm} (5.3)  
\[ \quad \text{and} \quad R_{mt} = \ln \frac{I_t}{I_{t-1}} \]  \hspace{1cm} (5.4)
Where \( P_{it} \) = The price of stock \( i \) at the end of period \( t \).

\( D_{it} \) = The dividend paid on stock \( i \) in period \( t \).

\( I_t \) = The value of a representative index at the end of period \( t \).

We can then define the price impact for stock \( i \) on day \( t \) as \( U_{it} \). Substituting 5.3 and 5.4 into 5.2 we get:

\[
E_{it} = U_{it} = \ln \left( \frac{P_{it} + D_{it}}{P_{it-1}} \right) - a_i - b_i \ln \frac{I_t}{I_{t-1}}
\]

(5.5)

If period \( t \) equals one day, the price impact \( U_{it} \) for stock \( i \) can be thought of as the return for a day of one dollar invested in stock \( i \) less a constant \( a_i \) and less the return an investment of one dollar in the index (times an appropriate constant, \( b_i \), to reflect the stock's normal relationship to the market) would have yielded.

The parameters \( a_i \) and \( b_i \) can be thought of as reflecting the normal relationship between stock \( i \) and the market. The \( b_i \) parameter is the "beta" measure of volatility. There is much controversy in the literature as to the stability of beta coefficients. Levy\(^1\) has recently presented data implying that beta stability is dependent on the number of securities in a portfolio and the length of time over which it is calculated. Betas for portfolios of at least 25 stocks cal-

culated over periods of 26 weeks or longer were found to be very stable and tended to have betas equal to one. However, stability dropped off for fewer securities or shorter time periods. Betas were not stable for one security portfolios.

Peterson\(^1\) and Mackey\(^2\) commented on Levy's results. Mackey offered evidence that long term beta stability might be decreasing in today's markets, while Peterson presented beta calculations for thirty stocks from four sources and shows how different the results are.

The SEC dealt with the problem as follows:

estimates of the "normal" relation were made but there was considerable ques-
tion as to their reliability. In addi-
tion, the findings were unchanged if it was assumed that \(a=0\) and \(b=1\).\(^3\)

Accordingly the SEC/K & S analyses were based on price impacts calculated with \(a=0\) and \(b=1\).

While there appears to be good grounds to support the simplifying assumption that beta equals one for all stocks, the possibility exists that beta values for portfolios of block traded stocks differ somewhat from one, especially when

---


particular subsets (such as all trades over $1 million) of the block trading data bank are examined. For this study beta values were estimated for each of the 213 different stocks which accounted for the 2,900 transactions.

The betas calculated were based on weekly price changes (Friday to Friday close) for the two year period July 1969 to June 1971 which covers the entire sample. Individual beta values were used in equation 5.5 for all price impact calculations (alpha was set equal to zero) but on average for the 213 stocks the following statistics were developed.

Mean Beta = 1.00  (Std. Dev. = 0.517)
Mean R Squared = 0.15  (Std. Dev. = 0.100)

Step 3: Calculation of Daily Price Impacts

Equation 5.5 will be used for daily price impact calculations over a 31 day period starting 15 days before the trade and ending 15 days after the trade, for a large sample of trades. In addition to the value of the $U_{it}$'s, the standard deviation of the daily price impact for each day will be calculated and as a non-parametric test the number of $U_{it}$'s which are negative will be monitored and reported.

The choice of a 31 day period is somewhat arbitrary. Scholes in his study of secondary distributions looked at what we call price impacts over a period 26 days before the
distribution to 14 days after. The SEC study chose a 41 day period, 20 days on each side of the trade. Scholes' 26 day lead period was based on the number of days ahead of time a secondary had to be registered. No specific justification was given for the 14 day lag period. The SEC study simply assumed a 41 day period to be long enough. Decreasing the time period covered reduces the computational effort, but increases the risk of missing an important effect. Lengthening the time period, on the other hand, increases the computational effort and increases the "noise" caused by including block trades that occurred after and before the chosen block day.

Neither the Scholes study nor the SEC/K & S study captured any peculiar effects at either end of the time periods used indicating that a longer time period was not necessary. Price impacts for this study were first calculated over a 41 day period adopting the SEC/K & S time period, but as no odd effects were found the analytic time period was shortened to 31 days. For each trade, price impacts and volume impacts will be calculated daily for the period beginning 15 trading days before the block trade and ending 15 trading days after the block day.

Daily price impacts will be plotted in a scatter diagram similar to Figure 5-2, to facilitate subsequent analysis.
Calculation of Intra Day Price Impacts

Because we know the price at which a block trade or secondary distribution actually took place we are able to investigate the very short term price effects that might be associated with large transactions on the day of the trade. This constitutes the second price impact test, and is best explained by means of a diagram. Figure 5-3 shows the intra day impact for a hypothetical purchase of a large block of stock. The vertical distance AB on the Y axis represents the percentage change in the stock's price from the closing price the day before the block to the block price. Line BC represents the percentage price change (or price recovery) from the block price to the close on the block day. Line AD represents the amount by which the price of the stock would have moved if it had moved exactly as much as the market did.

The price effects illustrated in Figure 5-3 are given by the following equations.

\[
AB = \frac{P_{it0-1} - P_{bi}}{P_{it0-1}} \times 100 \tag{5.6}
\]

\[
BC = \frac{P_{bi} - P_{it0}}{P_{bi}} \times 100 \tag{5.7}
\]

\[
AD = P_{it0-1} + \left( P_{it0-1} \frac{I_{t0-1} - I_{t0}}{I_{t0-1}} \times 100 \right) \tag{5.8}
\]
FIGURE 5-2
SCATTER DIAGRAM OF HYPOTHETICAL DAILY PRICE IMPACTS
(For a sample of block sales.)

FIGURE 5-3
INTRA DAY PRICE EFFECT FOR A HYPOTHETICAL BLOCK PURCHASE
Where $P_{it0-1}$ = The closing price of stock i on the day before the block traded.

$P_{bi}$ = The price at which the block of stock i traded.

$P_{it0}$ = The price of stock i at the close on the day of the block.

$I_{t0-1}$ = The value of the market index on the day before the block trade.

$I_{t0}$ = The value of the market index at the close on the day of the block.

In Figure 5-3 the distance DC is essentially the price impact for the day of the trade corresponding to the daily impacts described previously. It is clear from the diagram that a substantial price impact AB and subsequent recovery BC could be masked by the final impact DC. The object of this test is to uncover these short term effects if they do exist. The extent to which the price recovers from the block price to the close on day zero should aid in distinguishing between our competing hypotheses.

Calculation of the Price Impact Index

The final price impact test will be an examination of the cumulative effects of the individual daily price impacts over the 31 day period.

If $m$ is the first day of a period the cumulative impact index from day $m$ to day $t$ is, for a particular stock.

$$S_t = e^{\sum_{j=m}^{t} U_j}$$  \hspace{1cm} (5.9)
Where $S_{t}$ = The impact index for a particular stock cumulated over $m$ to $t$ days.

$U_{j}$ = The current impact for the particular stock.

The impact index may be thought of as equal to the return from investing a dollar at the succession of rates represented by the current impacts for days $m$, $m+1$, $m+2$, .... $m+t$.

This can be shown to be approximately true by using the facts that $\ln (1+r) \approx r$ for small values of $r$,\(^1\) and that

$$\sum_{j=m}^{t} \ln X_{j} = \ln \prod_{j=m}^{t} X_{j}.$$ 

Then we have:

$$\ln S_{t} = \sum_{j=m}^{t} U_{j}$$

$$\approx \sum_{j=m}^{t} \ln (1 + U_{j})$$

$$\approx \ln \left( \prod_{j=m}^{t} (1 + U_{j}) \right)$$

A plot of the price impact index yields the familiar charts of Chapter 2. Figure 5-4 below presents a hypothetical impact index plot showing a short lived price decrease at day 0.

The price impact plot appears to offer the clearest

---

\(^1\)For example $\ln 1.00 = 0.0000$ (i.e. $r=0.00$) $\ln 1.01 = 0.0099$ (i.e. $r=0.01$) $\ln 1.02 = 0.0198$ (i.e. $r=0.02$) $\ln 1.15 = 0.1398$ (i.e. $r=0.15$)
FIGURE 5-4

HYPOTHEtical PRICE IMPACT INDEX

PLOT FOR A SAMPLE

OF BLOCK SALES
picture of what the underlying price effect process is and indeed diagrams of this type have been used extensively in past work, and also in this study, to illustrate both the results of other researchers and to illustrate expected price effects under the various hypotheses considered here. Unfortunately, any cumulative statistic such as the price impact index can be misleading, especially when plotted in a figure such as Figure 5-4. The source of the potential bias is the fact each daily price impact is actually the mean of as many impacts as there are trades in the sample. There is then a distribution about the mean for each daily price impact and these distributions tend to be broad as evidenced by typically large standard deviations.¹ For the impact index we would expect a similar distribution about the mean for values of \( S_t \) when \( j \) equals or is close to \( m \) (i.e. at the start of the period). As we move further into the period (i.e. \( j \) increases) the price impact indexes represent increasing cumulations of daily impacts and it is possible that the distribution about the mean would widen. In short, the error associated with estimating the price impact index numbers can be expected to increase as \( j \) increases. This means that a plot such as Figure 5-4 becomes

¹See for example the standard deviations for the impact index figure reported in K & S "Price Impacts of Block Trading" Table 2, p. 579.
increasingly less accurate as we move from left to right.

To monitor the above situation standard deviations for each impact index number (for each \( j \)) will be calculated.

**Testing the Three Main Hypotheses**

To recap, we have described in the above section three statistical tests of price impacts and detailed how these statistics could be calculated for individual transactions. Of course results for an individual transaction are not particularly significant. To test our hypotheses we must aggregate the various statistics from many transactions. Essentially this is all that is involved in testing the Main hypotheses but a number of conventions must be made explicit before aggregation can be carried out.

One convention involves the determining of the actual price that a block trade took place at and another involves determining the actual date of the trade. Because most trades are carried out in more than one fill and the individual fills are often at varying prices, one cannot, for the majority of trades, say the trade took place at such and such a price. The best we can do, and the convention that will be established for this study, is to determine a weighted average price for the trade and to consider the whole trade to have taken place at that price. The weighted average price is calculated by dividing the total
value of the order by the number of shares involved. The date of the trade must also be decided on for trades that take place over a period longer than one day and for secondary distributions. Even trades that take place on one day but are crossed can be expected to have an extended impact depending on the length of time the broker was shopping for the other side. Time taken to trade is dealt with specifically as one of our independent variables but for the purposes of testing the main hypotheses all trades must be aggregated. We adopt the arbitrary conventions that all block trades take place on the first day of their trading period and that all secondary distributions take place on the day after they are formally announced on the ticker tape. It is impossible to know exactly when a block trade that was crossed became general knowledge. Some are probably known well in advance, while others are transacted very quickly. Nevertheless, we assume for the moment that crossed trades make their impact on the day they are crossed.

Two further but less controversial conventions deal with dividend dates and stock splits. Dividends are

---

1. Secondarys are usually announced one day before the "book" is opened but after the close on that day.

2. This assumption is changed in our testing of the time effect hypotheses, also the potential biases in these assumptions are discussed at that time.
assumed to make their impact on the day the stock first trades "X-dividend". For stock splits the prices over the 31 day period are simply adjusted to be consistent. For example, if a stock splits on day -10 (i.e. 10 days before the block) prices for days -15 to -11 are also split, if a split occurs on day +10 then prices for days +10 to +15 are reverse split.

To actually test the main hypotheses the three price impact tests will be carried out on at least 1,000 transactions that are classified as buys and for a similar number of sells. These samples, including both block trades and secondaries, will cover as wide a spectrum of values and trading times as possible. Table 5-1 below presents the results that would be expected under each of the three main hypotheses for each of the three tests. Results for sales would be expected to be in the opposite direction to those for buys.

Testing of Auxiliary Hypotheses

Price Impact Versus Value Traded:
Hypotheses H1Al, H2Al, H3Al

The first set of auxiliary hypotheses explores the relationship between price impacts and the value of particular

---

1 The X-dividend date is the first day when purchasers of a stock do not receive a pending dividend (i.e. a dividend that has been announced but not yet paid).
<table>
<thead>
<tr>
<th>TEST 1</th>
<th>TEST 2</th>
<th>TEST 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily price impacts</td>
<td>Intra day price impact</td>
<td>Price impact index</td>
</tr>
<tr>
<td>No effect</td>
<td>Small effect if any</td>
<td>No systematic deviation from 1.00</td>
</tr>
<tr>
<td>Short term, not more than 3 days with full recovery</td>
<td>Definite effect but with a substantial recovery</td>
<td>Marked deviation on or just before day 0, with full recovery on or before day +5</td>
</tr>
<tr>
<td>No effects until day of block or a bit before. No recovery</td>
<td>Definite effect with little or no recovery</td>
<td>Marked deviation on or before day 0 with little or no recovery by day +15</td>
</tr>
</tbody>
</table>

trades. To test these hypotheses we must first establish a definitional measure of "value of the transaction" and then decide on a method of determining what the relationship might be.

The most appropriate measure of value would seem to be, on an intuitive basis, the per cent of the value of the float involved. For example, if a corporation has two million
shares outstanding of which say one million are owned by a foreign parent, then we would say that the float is one million shares. The value of a trade in that stock would be expressed as a per cent of the float. This method is empirically hard to apply as float figures are not readily available. A slightly cruder measure would be to express the trade as a percentage of common equity outstanding, while the crudest but most readily applicable method is simply to use the dollar value of the trade. Scholes tested these last two value measures and found they led to similar results.¹ The SEC used dollar value of the trade. Here dollar value of the trades will be used which incorporates the institution's view point as explained in Chapter 1 (pages 8 & 9).

Volume discount rebates increase in a stepwise function with increasing value. It seems reasonable then to divide our sample into categories corresponding to the various discount ranges. The rebate schedule works as follows:

1. 30% off the regular commission on orders between $100,000 and $249,999.
2. 40% off the portion of an order between $250,000 and $499,999.
3. Commissions on the portion of an order over $500,000 are discretionary.

Category one includes by far the largest number of

¹Scholes in "The Market for Securities" reports value as a per cent of equity outstanding, while in his dissertation he also uses dollar amount. Results are similar. The SEC uses dollar value as their measure.
block trades and it seems prudent to split it by forming
two categories, and similarly as category three is open
ended an extra division for trades over $1 million might
be interesting especially as all the SEC analyses were
based on a sample of trades over this amount. The data
will then be broken into the following 5 subsamples.

1. $100,000 to $174,999
2. $175,000 to $249,999
3. $250,000 to $499,999
4. $500,000 to $1,000,000
5. over $1,000,000

Table 5-2 indicates how many trades are included in
each category.

**TABLE 5-2**

<table>
<thead>
<tr>
<th>Value Class</th>
<th>Buys</th>
<th>Sells</th>
<th>Zeroticks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,114</td>
<td>141</td>
<td>55</td>
<td>1,910</td>
</tr>
<tr>
<td>2</td>
<td>256</td>
<td>206</td>
<td>11</td>
<td>473</td>
</tr>
<tr>
<td>3</td>
<td>198</td>
<td>176</td>
<td>12</td>
<td>386</td>
</tr>
<tr>
<td>4</td>
<td>62</td>
<td>43</td>
<td>4</td>
<td>109</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>6</td>
<td>2</td>
<td>22</td>
</tr>
</tbody>
</table>

For each of the 5 subsamples aggregate price impacts
for a 31 day period, intra day price impacts, and a 31 day
price impact index will be calculated. The results of the
three different tests will then be compared and tested for
significant differences.
Comparing Subsample Results

Intra day results consist of two principal figures, the close to block price change and the block to close price change. Each of these figures for each subsample will be a mean value from samples of various sizes. Analysis of variance (ANOVAR) is a powerful statistical tool designed to test for significant differences between means. ANOVAR will be used to test if there is any significance between mean intra day price impacts for various value classifications. If it is found that impacts associated with larger trades are greater than those associated with smaller trades, and that this difference is significant, then this would be interpreted as support for H2A1. Little or no relationship would support H1A1 and H3A1.

Daily price impacts would also be compared and tested for significant differences using ANOVAR. For this test, however, the 31 individual price impacts could be considered as observations in a 31 X 5 matrix. ANOVAR would be used to test for significant differences between the columns (i.e. each value classification). Figure 5-5 shows a sample test matrix. The significance in differences between the categories, if any, would be interpreted in the same way as intra day results.

The final test, price impact index calculations, would be used as added confirmation. Here the most useful approach
**FIGURE 5-5**

**HYPOTHETICAL VALUE CATEGORY COMPARISON**

**MATRIX**

<table>
<thead>
<tr>
<th>DAY</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>-14</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>-13</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>-1</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>0</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>1</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>13</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<tr>
<td>14</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>15</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

* Represents the daily price impact for the row day and column subsample.

M Represents the column mean.

ANOVAR will be used to test for the significance, if any, between the M's.

H2A1 predicts that M(1) < M(2) < M(3) < M(4) < M(5)

H1A1 & H3A1 predict M(1) = M(2) = M(3) = M(4) = M(5)
would be to plot the five indexes and examine the charts
(which would be similar to Figure 5-4) for any systematic
differences between categories.

Price Impacts Versus Time Taken to Trade:
Hypotheses H1A2, H2A2, H3A2

The second set of auxiliary hypotheses involves the
relationship between the price impact and the time the trade
required. Here there is little difficulty deciding what
time categories to use for the volume discount rules allow
any trade completed within five trading days. We shall pro-
ceed by breaking up our data into 1 day, 2 day, 3 day, 4 day
and 5 day subsamples. This division produces one bias to-
wards H3A2 (the information effect hypothesis) for weekends
are not included in the 5 days while information could be
disseminated, although not acted on, over the weekend. The
bias is, however, expected to be the same in each subsample.
There still remains two more problems. 1) How to treat
crossed trades? 2) How to treat secondaries?

On the grounds that there is usually a shopping process
before a trade is crossed it can be postulated that there is
a certain amount of information leaked out into the market.
Hence it is not unlikely that a price impact might be
spread over a few days rather than only on the one day on
which the trade was crossed. On the other hand some crosses
are set-up and executed in a matter of minutes and many
blocks that are not crossed were shopped around as brokers
attempted to find the other side. For such blocks an argument can be made that information about the impending block was available to the market prior to the actual transaction. Even blocks that do not trade can influence prices for if it is generally known that an institution has a large block of a particular stock to sell other investors are reluctant to buy that stock for they reason that as long as this block is "overhanging the market" the price will not appreciate.

The convention adopted here is to treat trades that are completely crossed as 1 day trades. Trades that are mixed will be treated normally if the amount crossed is less than half the total value of the trade, otherwise they will be considered as crosses. Secondaries will all be treated as 5 day trades.

Table 5-3 indicates how many trades are included in each of the 5 time categories.

<table>
<thead>
<tr>
<th>Duration</th>
<th>Buys</th>
<th>Sells</th>
<th>Zeroticks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>886</td>
<td>707</td>
<td>79</td>
<td>1,672</td>
</tr>
<tr>
<td>2 days</td>
<td>300</td>
<td>175</td>
<td>2</td>
<td>477</td>
</tr>
<tr>
<td>3 days</td>
<td>176</td>
<td>102</td>
<td>1</td>
<td>279</td>
</tr>
<tr>
<td>4 days</td>
<td>118</td>
<td>87</td>
<td>2</td>
<td>207</td>
</tr>
<tr>
<td>5 days</td>
<td>163</td>
<td>101</td>
<td>0</td>
<td>264</td>
</tr>
</tbody>
</table>

Subsequent analysis of price impact results from the three tests applied to all five time categories will be
carried out in a manner completely analogous to the methods used for testing value and price impact relationships. If a significant negative relationship is found between time taken to trade and the associated price impact this will lend support to H2A2. If no significant relationship is found H1A2 and H3A2 are supported.

One possible bias arises from our convention of considering the price of the stock on the first day of the trade as the price on which to base intra day impacts. This convention might tend to under-state impacts on days -3 to -1 while over-stating impacts on the next few days after the trade. This is a bias against H3A2 for trades of more than one day. Possible alternatives such as using an average price for the security on the basis of the prices each day the trade was in progress, or using the price on the middle day, all have their biases too and are significantly more difficult computationally. The two other tests, daily price impacts and the price impact indexes will not be biased and their results can be relied on more heavily.

Price Impacts Versus Institutional Activity:
Hypotheses H1A3, H2A3, H3A3

The A3 series of hypotheses involve the relationship between price impacts and the degree of institutional interest in the particular security. Here only two classification levels are considered feasible, i.e. stocks that have a high institutional interest and those that have a low institu-
tional interest. To sharpen the test there will be a large number of stocks not included in the test because they have an institutional following somewhere between high and low.

To test these hypotheses we must develop some measure of institutional interest or following. There is a host of potential measures to choose from. The strategy to be used here is to select stocks on several different criteria, rank each stock on each criterion and then sum the rank scores and rerank on a basis of the lowest score having the highest institutional interest. Three measures that seem to be intuitively reasonable and that are available are:

1. The number of funds holding the particular stock in their portfolios at a given date.
2. The per cent of the stock's outstanding equity capital held by institutions at a particular date.
3. The number of block trades in the particular stock over the sample time period.

It was possible to rank 207 of the 213 stocks in the data bank on the three criteria presented above and a composite rank was calculated. The top 50 stocks were called the high interest group while the bottom 50 (to have a more nearly equal number of trades in each sample) were called the low interest group. Table 5-4 lists the top 5 and bottom 50 stocks in rank order. The three standard price impact tests will be carried out on the two samples and the results compared. This time the tests involve comparing only two means and another but similar statistical test, the "t" test
TABLE 5-4

Ranking of Stocks by Institutional Interest

**Top Five** (a rank of 1 means the highest institutional interest)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moore Corporation Ltd.</td>
</tr>
<tr>
<td>2</td>
<td>Canadian Imperial Bank of Commerce</td>
</tr>
<tr>
<td>3</td>
<td>Dominion Foundries and Steel Ltd.</td>
</tr>
<tr>
<td>4</td>
<td>Falconbridge Nickel Mines Ltd.</td>
</tr>
<tr>
<td>5</td>
<td>Northern and Central Gas Corp. Ltd.</td>
</tr>
</tbody>
</table>

**Bottom Fifty** (a rank of 1 means the lowest institutional interest)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FPE-Pioneer Electric Ltd.</td>
</tr>
<tr>
<td>2</td>
<td>Grafton Group Ltd.</td>
</tr>
<tr>
<td>3</td>
<td>Maritime Tel. &amp; Tel.</td>
</tr>
<tr>
<td>4</td>
<td>Guaranty Trust Co. of Can.</td>
</tr>
<tr>
<td>5</td>
<td>*Ocean Cement &amp; Supplies</td>
</tr>
<tr>
<td>6</td>
<td>Northland Oils Ltd.</td>
</tr>
<tr>
<td>7</td>
<td>Roman Corp. Ltd.</td>
</tr>
<tr>
<td>8</td>
<td>United Corp. Ltd. A</td>
</tr>
<tr>
<td>9</td>
<td>Western Can. Seed Processors</td>
</tr>
<tr>
<td>10</td>
<td>Great Can. Oil Sands Ltd.</td>
</tr>
<tr>
<td>11</td>
<td>Craigmont Mines Ltd.</td>
</tr>
<tr>
<td>12</td>
<td>Copperfields Mining Corp.</td>
</tr>
<tr>
<td>13</td>
<td>B.C. Sugar Refining Co.</td>
</tr>
<tr>
<td>14</td>
<td>Asamera Oil Corp.</td>
</tr>
<tr>
<td>15</td>
<td>Trizec Corp. Ltd.</td>
</tr>
<tr>
<td>16</td>
<td>Numac Oil &amp; Gas Ltd.</td>
</tr>
<tr>
<td>17</td>
<td>B.C. Forest Products Ltd.</td>
</tr>
<tr>
<td>18</td>
<td>Nu-West Homes Ltd.</td>
</tr>
<tr>
<td>19</td>
<td>Goodyear Tire &amp; Rubber Can.</td>
</tr>
<tr>
<td>20</td>
<td>Can. Tungsten Mining Corp.</td>
</tr>
<tr>
<td>21</td>
<td>Cummings Properties Ltd.</td>
</tr>
<tr>
<td>22</td>
<td>Versafood Services Ltd.</td>
</tr>
<tr>
<td>23</td>
<td>Brunswick M &amp; S Corp.</td>
</tr>
<tr>
<td>24</td>
<td>Ranger Oil Can. Ltd.</td>
</tr>
<tr>
<td>26</td>
<td>Westburne Int. Ind. Ltd.</td>
</tr>
<tr>
<td>27</td>
<td>British Nfld. Corp. Ltd.</td>
</tr>
<tr>
<td>28</td>
<td>Toronto Star Ltd. B</td>
</tr>
<tr>
<td>29</td>
<td>Greyhound Lines Can. Ltd.</td>
</tr>
<tr>
<td>30</td>
<td>Labrador Mining &amp; Exp.</td>
</tr>
<tr>
<td>31</td>
<td>Steep Rock Iron Mines</td>
</tr>
<tr>
<td>32</td>
<td>Giant Mascot Mines Ltd.</td>
</tr>
<tr>
<td>33</td>
<td>Great W. Int. Equities</td>
</tr>
<tr>
<td>34</td>
<td>St. Lawrence Cement Co.</td>
</tr>
<tr>
<td>35</td>
<td>Aimco Industries Ltd.</td>
</tr>
<tr>
<td>36</td>
<td>Investors Group</td>
</tr>
<tr>
<td>37</td>
<td>Can. Industries Ltd.</td>
</tr>
<tr>
<td>38</td>
<td>Ford Motor of Can.</td>
</tr>
<tr>
<td>39</td>
<td>Phillips Cables Ltd.</td>
</tr>
<tr>
<td>40</td>
<td>Denison Mines Ltd.</td>
</tr>
</tbody>
</table>

*More than one listing under the same rank indicates ties.*
will be used in place of ANOVAR to look for significance between the mean price impacts for stocks with a high institutional following versus stocks with a low institutional following.

$H_{1A3}$ and $H_{3A3}$ predict that there would be no significant relationship between the price impacts of the two samples. $H_{2A3}$ would predict that there would be a significant difference with mean price impacts for the low interest group exceeding those for the high interest group.

Volume Impacts:
Hypotheses $H_{1A4}$, $H_{2A4}$, $H_{3A4}$

Our final auxiliary hypotheses concern the behaviour of volume impacts for large value transactions. Volume impacts are expected to offer important help in differentiating between $H_1$ and $H_3$ which up to now have tended to produce similar predicted results for our other tests. Volume impacts are essentially another dependent variable and are calculated in a manner analogous to price impacts with the exception of intra day impacts which are not strictly applicable as there is no way of segregating volume before and after the trade on the block day.

In a fashion parallel to the development of price effect measures, we can define a volume impact as the effect a block trade has on the volume of shares traded. As with price effects we must adjust for the "normal" market volume. The volume impact ($W$) for stock ($i$) on day ($t$) can be
defined as:

\[ W_{it} = \ln \frac{V_{it}}{V_{it-1}} - \ln \frac{V_{m_t}}{V_{m_{t-1}}} \]  

(5.11)

Where: \( V_{it} \) = The volume of shares traded for stock i on day t.

\( W_{it} \) = Is defined to be the volume impact for stock i on day t.

\( V_{m_t} \) = The volume for some representative index (the TSE Industrial Index) for day t.

A volume impact index can also be constructed exactly the same way as the price impact index.

\[ \sum_{j=t}^{m} W_j \]

\( SV_t = e \)  

(5.12)

Where: \( SV_t \) = The volume impact index for a particular stock cumulated over a period beginning on day m and ending on day t.

\( W_j \) = The current volume impact for the particular stock on day j.

To test for volume effects, volume impacts on a daily basis and volume impact indexes will be calculated for both purchases and sales for the whole data bank and a set of subsamples designed to examine the value, time and institutional interest classifications.

Predicted results for volume impact tests vary under each of the three hypotheses. H1A4 would predict that volume impacts would be positive but of short duration. A positive impact means that there appears to be abnormal volume in the
stock compared to the market as a whole, or for a particular
day, the change in volume of trading in the stock is greater
than that which can be attributed to the change in volume of
trading of the index as a whole, for that day. Volume
impacts can be positive or negative but all the hypotheses
call for a positive impact at least on the day of the trade
because a block trade is almost certain to result in above
normal trading volume if only to reflect the number of
shares in the block itself.

To account for the effect of the block on the block
day the volume impact will be compared to the average
number of shares in large transactions. It can then be
determined if the actual volume impact exceeds the impact
due to the volume of the trade alone.

To restate the expected results from H1A4 more accu-
rately, we would expect a positive impact over and above the
impact due to the trade itself but that this impact would be
short lived lasting no more than the day of the trade.
H2A4 would predict a positive impact but here it would not
be expected to exceed the volume impact due to the trade
itself. H3A4 would predict positive impacts to last for a
period of several days perhaps starting a day or so before
the block day and continuing until up to 5 days after the
block day. Impacts on the day of the trade would be expected
to exceed those due to the trade itself.

Figure 5-6 shows volume impact index plots as predicted
FIGURE 5-6

PREDICTED VOLUME IMPACT INDEXES FOR HYPOTHESES:

H1A4   H2A4   H3A4

(Note: Plots for buys and sells should be similar.)
by each hypotheses. Testing subsamples made up of trades which meet specific value, time and institutional interest criteria will counteract the various biases that arise in analysing a sample of all types of trades.

Additional Testing of Auxiliary Hypotheses

A logical next step in testing the various auxiliary hypotheses is to calculate price impacts for subsamples that have been selected by simultaneously controlling two or more independent variables. For example we could look at all trades over $1 million that took 5 days to trade (two variables) or all trades over $1 million that took 5 days and were in high institutional interest stocks (three variables). Theoretically there are 85 possible combinations of the 5 value, 5 time and 2 institutional interest classifications (actually 190 when buys and sells are segregated). In practice the sample size in these multi-criteria subsamples is usually too small to make any meaningful generalizations. As a result such tests will only be made if it is considered necessary to sharpen the results of other tests and the sample size is large enough to make such testing feasible.

Summary and Final Sample

This chapter has described a sampling plan whereby a sample of 2,900 large value transactions was developed.
Trades in 213 different stocks over various time periods in 1970 and 1971 constitute the sample which has been cross classified into 5 value classifications from $100,000 to over $1 million, into 5 time to trade classifications, and whether the trade was a buy or a sell.

Two final data screens were carried out to eliminate discontinuous price and volume histories, and to check for errors causing extremely large day to day price changes. In the FRI data banks prices on days when the exchange is closed are reported as zero. To adjust for this these zero prices, when encountered, were replaced by the closing price the day before, but if more than three zero days were reported consecutively the trade was rejected.\(^1\) The second screen isolated daily price changes over 30 per cent. All such events were checked to see if a split had taken place. If so the prices were adjusted accordingly, but if no split was encountered the trade was rejected.

Applying these screens further reduced the size of the usable sample to a total of 1541 buys and 1092 sells classified by value and time to trade as follows.

---

\(^1\)In the FRI data prices for stocks that did not trade on any particular day (except when the exchange was closed) are automatically reported at the closing price on the day they last traded.
<table>
<thead>
<tr>
<th>By Value Class</th>
<th>Number of Trades Buys</th>
<th>Number of Trades Sells</th>
<th>By Time to Trade</th>
<th>Number of Trades Buys</th>
<th>Number of Trades Sells</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1038</td>
<td>693</td>
<td>1 Day</td>
<td>834</td>
<td>665</td>
</tr>
<tr>
<td>2</td>
<td>243</td>
<td>189</td>
<td>2 Days</td>
<td>280</td>
<td>155</td>
</tr>
<tr>
<td>3</td>
<td>190</td>
<td>167</td>
<td>3 &quot;</td>
<td>168</td>
<td>99</td>
</tr>
<tr>
<td>4</td>
<td>58</td>
<td>38</td>
<td>4 &quot;</td>
<td>112</td>
<td>82</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>5</td>
<td>5 &quot;</td>
<td>147</td>
<td>91</td>
</tr>
<tr>
<td>Totals</td>
<td>1541</td>
<td>1092</td>
<td></td>
<td>1541</td>
<td>1092</td>
</tr>
</tbody>
</table>

A number of analytical methods by which the 3 main and 12 auxiliary hypotheses developed in Chapter 4 can be tested were then described. The test method involves the repetition of three price impact tests on a large number of large value transactions divided into subsamples by buy/sell status, value of the trade, time to trade and institutional interest. In a parallel fashion volume impacts are also introduced and volume impact tests described.

Chapter 6 which follows presents the results produced by applying these tests to the data bank developed for the study.
CHAPTER 6

RESULTS

This chapter reports the results produced by carrying out the empirical testing described in Chapter 5. Price impact results for all buys and all sells are considered first, then the relationship between price impacts and the four independent variables of Chapter 3 (value, time, institutional interest and volume) are examined. Finally, the results of some additional testing for sampling biases are reported.

Main Hypotheses H1, H2, H3

Test 1: Intra Day Effects

Table 6-1 shows the intra day effects for 1541 block trades\(^1\) which were classified as buys and 1092 large value transactions classified as sells.

For buys the table illustrates (line 1) that on the day of a block trade the price of the stock rose on average 0.432 per cent. This rise consisted of a 0.339 per cent

\(^1\)These aggregate results come from considering the 9 sample periods, described in Chapter 5, as one large sample. To do so implies the assumption that price impacts are independent of the period sampled. A test, the results of which confirm this assumption, is reported later in the chapter.
rise from the closing price the day before the block day to the block price (line 2) complemented by a 0.093 per cent increase in price from the block price to the closing price the day of the block. Line 4 of the table gives the average change in the index over the block day.

TABLE 6-1

INTRA DAY EFFECTS FOR ALL BUYS AND ALL SELLS

<table>
<thead>
<tr>
<th>LINE</th>
<th>Sample Size</th>
<th>BUYS Mean</th>
<th>BUYS Std. Error</th>
<th>SELLs Mean</th>
<th>SELLs Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1541</td>
<td>1092</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Chg. day -1 to block</td>
<td>.339%</td>
<td>.093</td>
<td>3.65</td>
<td>-.494%</td>
<td>.204</td>
</tr>
<tr>
<td>2 Chg. block to day 0 Close</td>
<td>.093%</td>
<td>.082</td>
<td>3.21</td>
<td>.129%</td>
<td>.190</td>
</tr>
<tr>
<td>3 Net change (1+2)</td>
<td>.432%</td>
<td>.086</td>
<td>3.45</td>
<td>-.365</td>
<td>.197</td>
</tr>
<tr>
<td>4 Chg. in index day-1 to 0</td>
<td>-.049%</td>
<td>.013</td>
<td>.50</td>
<td>-.097%</td>
<td>.017</td>
</tr>
</tbody>
</table>

The results for buys support H3 (the information effect hypothesis) from the finding that a price increase before a block is confirmed by a further price increase after the trade. There is no indication of a price recovery (in this case a price drop) which would be expected under H2 (the liquidity or price pressure hypothesis). On average then, for trades that were buys, price increased .432 per cent over the day of the block, while the index fell .049 per cent.

For sales, on the other hand, a similar analysis lends support to H2 for the drop in price from the close on day-1
is partially reversed by a rise in price after the trade. This leads to a net average drop of .365 per cent over the block day, while the index fell .097 per cent.

It is worth noting at this stage that the above figures and indeed almost all the results presented in this chapter are a measure of the central tendency of a distribution of many individual observations. Standard errors of these reported means tend to be large indicating a measure of uncertainty associated with these results. This uncertainty varies directly with the standard deviation\(^1\) and inversely with the square root of the sample size. For this reason large samples have been utilized which result in relatively narrow confidence intervals. For example we can be 95 per cent sure that the true mean for the net change day -1 to day 0 for all buys lies between .260 per cent and .604 per cent\(^2\) while for sales the 95 per cent confidence interval is -.752 per cent to +.022 per cent.

Confidence intervals such as these are based on the assumption that the observed price impacts are normally distributed. It will be recalled from Chapter 2 that the residual analysis model used here was originally employed by Fama et al.\(^3\) in their work on the price effects of stock

\(\text{\(^1\)The standard error reported (σX) is the population standard deviation (σ) divided by the square root of the sample N.}
\)

\(\text{\(^2\)Where X is the observed mean and μ is the true mean the 95% confidence interval is given by the relation:}
\)

\[ P(\bar{X} - 1.96 \sigma \bar{X} < \mu < \bar{X} + 1.96 \sigma \bar{X}) = .95 \]

\(\text{\(^3\)Eugene F. Fama et al., "The Adjustment of Stock Prices to New Information."}
\)
splits. Both Fama et al. and later Scholes\(^1\) go to some length in showing that the log. of stock price changes relative to the market (the price relative) are not normally distributed but conform to the symmetrical stable Paretian family of non-Gaussian distributions. Both authors reference the work of John Wise\(^2\) who has shown that least squares estimates provide unbiased and consistent estimates for most members of the stable Paretian family of distributions. The implications for this study are that even though the distribution of price impacts are not normal the mean is an unbiased estimator, hence a suitable measure of central tendency. The dispersion of the distribution is, however, more difficult to deal with both conceptually and empirically, for a key property of stable Paretian distributions is that they have infinite variances. Statistically this means they tend to have "fat tails" or in other words the probability of an observation being in say the .5 per cent area would be higher for a Paretian distribution than for a normal distribution. Confidence intervals based on the standard error are probably underestimated. Fama in an earlier article\(^3\) suggests that

\(^1\)Myron S. Scholes, "Dissertation".


\(^3\)Eugene F. Fama, "The Behaviour of Stock Market Prices", Journal of Business, XXXVIII, No. 38 (Jan. 1965), 34-105. See
the mean absolute deviation is a more stable estimate of the
dispersion of a Paretian process but for samples over 300
there appears to be little difference. Both Scholes and the
SEC used the standard deviation as their measure of dispersion
as has been done here.

Akin to the issue of measuring dispersion is a considera-
tion of the shape of these distributions. Here there is strong
and consistent evidence that distributions of the log. of
price relatives are symmetrical, that is to say, the proba-
bility of an observation being in one tail is similar to the
probability of being in the other tail as the distribution
is not skewed. On this basis the mean and standard deviation
are used here as summary statistics to describe these distri-
butions.

Re-interpreting the results shown in Table 6-1 we can
say that for the net change (line 3) for all buys the average
impact is a positive price change of .432 per cent and in
every 200 trades making up this average we would expect to
find at least 5 impacts greater than 7.0 per cent\(^1\) and 5 to
have impacts less than -6.0 per cent. Also we would expect
at least two trades with an impact over 8.3 per cent\(^2\) and at

\(^1\) Here we use the fact that 95% of the area under a normal
curve lies between \(X=\mu-1.96\sigma\) and \(X=\mu+1.96\sigma\), or in this case
between .432-1.96x3.45 and .432+1.96x3.45.

\(^2\) .432 + 2.33 x 3.45.
least two under -7.4 per cent. We do not know just what these maximum and minimum values actually are except that they are less than 30 per cent as this was the arbitrary cut off point used in the error check described at the end of Chapter 5.

For sales we would expect to find at least 5 of every 200 trades with impacts over 12 per cent and 5 trades with impacts less than -13 per cent. At the two per cent level 2 trades would be expected over 14 per cent and 2 under -15 per cent.

Table 6-1 reports results for all trades, some of which took place over more than one day. The fact that there was additional block buying after day 0 could well account for the price increase from the block to the close day 0, for the intra day effect implicitly assumes all the effect took place on the first day of multi day trades. We can eliminate this possible bias by examining only those trades that took place over one day. Table 6-2 below reports intra day effects for all buys and all sells that took only one day to trade.

The sample sizes for one day trades are still large and significantly confirm the conclusions derived from Table 6-1. Both the mean values and standard errors reported in the two tables appear similar and the results of statistical testing for differences between means and standard deviations failed to find any differences above the .40 level of significance. We can conclude from this that the two samples are drawn from the same population.
### TABLE 6-2

**INTRA DAY EFFECTS FOR ALL ONE DAY TRADES**

<table>
<thead>
<tr>
<th>LINE</th>
<th>Sample Size</th>
<th><strong>BUYS</strong></th>
<th></th>
<th><strong>SELLS</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Error</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td>1 Chg. day -1 to block</td>
<td>.328%</td>
<td>.102</td>
<td>2.95</td>
<td>-.536%</td>
<td>.263</td>
</tr>
<tr>
<td>2 Chg. block to close day 0</td>
<td>.041%</td>
<td>.090</td>
<td>2.60</td>
<td>.098%</td>
<td>.238</td>
</tr>
<tr>
<td>3 Net Change (1+2)</td>
<td>.432%</td>
<td>.095</td>
<td>2.74</td>
<td>-.438%</td>
<td>.231</td>
</tr>
<tr>
<td>4 Chg. in index day -1 to 0</td>
<td>-.046%</td>
<td>.017</td>
<td>.50</td>
<td>-.102%</td>
<td>.023</td>
</tr>
</tbody>
</table>

**Test 2: Daily Price Impacts**

Tables 6-3 and 6-4 give daily price impacts for the 31 day period 15 trading days before the block to 15 trading days after the block day (day 0). These impacts are reported in column 2 of the tables, column 3 gives the percent of these impacts that were negative, column 4 gives the standard error of the mean daily price impacts and column 5 gives the standard deviation of these distributions. The impact index results (columns 6 and 7) will be discussed in the next section.

As with intra day results daily price impacts are actually mean impacts for a large number of trades with an associated distribution. The large sample sizes, however, lead to small standard errors about these means and tight
### TABLE 6-3

**PRICE IMPACT RESULTS FOR 1541 BUYS**

<table>
<thead>
<tr>
<th>DAY</th>
<th>MEAN (1)</th>
<th>% NEG. (2)</th>
<th>STD. ERROR (3)</th>
<th>STD. DEV. (4)</th>
<th>MEAN (5)</th>
<th>STD. ERROR (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>0.0006</td>
<td>47.50</td>
<td>.00040</td>
<td>.0155</td>
<td>1.0006</td>
<td>.00047</td>
</tr>
<tr>
<td>-14</td>
<td>0.0007</td>
<td>47.83</td>
<td>.00040</td>
<td>.0157</td>
<td>1.0014</td>
<td>.00058</td>
</tr>
<tr>
<td>-13</td>
<td>0.0012</td>
<td>47.31</td>
<td>.00042</td>
<td>.0166</td>
<td>1.0027</td>
<td>.00070</td>
</tr>
<tr>
<td>-12</td>
<td>-0.0010</td>
<td>52.50</td>
<td>.00040</td>
<td>.0156</td>
<td>1.0019</td>
<td>.00080</td>
</tr>
<tr>
<td>-11</td>
<td>-0.0001</td>
<td>49.19</td>
<td>.00040</td>
<td>.0158</td>
<td>1.0019</td>
<td>.00091</td>
</tr>
<tr>
<td>-10</td>
<td>0.0010</td>
<td>46.40</td>
<td>.00040</td>
<td>.0155</td>
<td>1.0030</td>
<td>.00099</td>
</tr>
<tr>
<td>- 9</td>
<td>0.0000</td>
<td>48.93</td>
<td>.00042</td>
<td>.0163</td>
<td>1.0031</td>
<td>.00104</td>
</tr>
<tr>
<td>- 8</td>
<td>0.0002</td>
<td>51.20</td>
<td>.00045</td>
<td>.0178</td>
<td>1.0035</td>
<td>.00113</td>
</tr>
<tr>
<td>- 7</td>
<td>0.0002</td>
<td>46.66</td>
<td>.00039</td>
<td>.0152</td>
<td>1.0037</td>
<td>.00119</td>
</tr>
<tr>
<td>- 6</td>
<td>-0.0002</td>
<td>49.51</td>
<td>.00037</td>
<td>.0144</td>
<td>1.0037</td>
<td>.00123</td>
</tr>
<tr>
<td>- 5</td>
<td>0.0004</td>
<td>48.54</td>
<td>.00041</td>
<td>.0159</td>
<td>1.0042</td>
<td>.00128</td>
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<tr>
<td>- 4</td>
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<td>.00045</td>
<td>.0176</td>
<td>1.0044</td>
<td>.00139</td>
</tr>
<tr>
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<td>.00041</td>
<td>.0159</td>
<td>1.0059</td>
<td>.00147</td>
</tr>
<tr>
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<td>0.0009</td>
<td>48.22</td>
<td>.00046</td>
<td>.0179</td>
<td>1.0069</td>
<td>.00151</td>
</tr>
<tr>
<td>- 1</td>
<td>0.0012</td>
<td>46.01</td>
<td>.00044</td>
<td>.0179</td>
<td>1.0083</td>
<td>.00160</td>
</tr>
<tr>
<td>0</td>
<td>0.0046*</td>
<td>38.35</td>
<td>.00061</td>
<td>.0238</td>
<td>1.0133</td>
<td>.00180</td>
</tr>
<tr>
<td>1</td>
<td>0.0015</td>
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<td>.00045</td>
<td>.0178</td>
<td>1.0148</td>
<td>.00177</td>
</tr>
<tr>
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<td>0.0008</td>
<td>46.79</td>
<td>.00046</td>
<td>.0180</td>
<td>1.0157</td>
<td>.00182</td>
</tr>
<tr>
<td>3</td>
<td>0.0002</td>
<td>48.41</td>
<td>.00048</td>
<td>.0189</td>
<td>1.0162</td>
<td>.00191</td>
</tr>
<tr>
<td>4</td>
<td>-0.0010</td>
<td>49.71</td>
<td>.00042</td>
<td>.0166</td>
<td>1.0151</td>
<td>.00187</td>
</tr>
<tr>
<td>5</td>
<td>0.0005</td>
<td>46.72</td>
<td>.00042</td>
<td>.0163</td>
<td>1.0157</td>
<td>.00190</td>
</tr>
<tr>
<td>6</td>
<td>0.0000</td>
<td>48.60</td>
<td>.00037</td>
<td>.0144</td>
<td>1.0158</td>
<td>.00192</td>
</tr>
<tr>
<td>7</td>
<td>-0.0005</td>
<td>46.14</td>
<td>.00044</td>
<td>.0171</td>
<td>1.0153</td>
<td>.00194</td>
</tr>
<tr>
<td>8</td>
<td>0.0009</td>
<td>44.32</td>
<td>.00039</td>
<td>.0154</td>
<td>1.0163</td>
<td>.00199</td>
</tr>
<tr>
<td>9</td>
<td>-0.0012</td>
<td>49.45</td>
<td>.00044</td>
<td>.0172</td>
<td>1.0153</td>
<td>.00205</td>
</tr>
<tr>
<td>10</td>
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<td>47.96</td>
<td>.00038</td>
<td>.0149</td>
<td>1.0154</td>
<td>.00209</td>
</tr>
<tr>
<td>11</td>
<td>-0.0001</td>
<td>47.24</td>
<td>.00040</td>
<td>.0157</td>
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<td>14</td>
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<td>0.0001</td>
<td>47.11</td>
<td>.00042</td>
<td>.0166</td>
<td>1.0171</td>
<td>.00225</td>
</tr>
</tbody>
</table>

*The corresponding value from Table 6-1 (.432 + .049 = .481%) differs slightly from the .46% reported here as the Table is calculated directly in per cent while the impact is a ratio of the logs. of price relatives.
### TABLE 6-4

PRICE IMPACT RESULTS FOR 1092 SALES

<table>
<thead>
<tr>
<th>DAY (1)</th>
<th>MEAN (2)</th>
<th>% NEG. (3)</th>
<th>STD. ERROR (4)</th>
<th>STD. DEV. (5)</th>
<th>MEAN (6)</th>
<th>STD. ERROR (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>-0.0002</td>
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<td>.0150</td>
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<td>-14</td>
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<td>.0167</td>
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<td>-13</td>
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<td>1.0070</td>
<td>.00273</td>
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</tbody>
</table>

*The corresponding value from Table 6-1 is -0.268% (-.365 + .097).*
confidence intervals. For example, the impact for buys on day 0 (Table 6-3) is reported as +.0046 but we are 95 per cent sure that the true mean lies between +.0034 and +.0058. For sales the day 0 price impact is -.0028 and we are 95 per cent sure that the true mean lies between -.0041 and -.0015. Column 3, the per cent negative column, adds further evidence as to the sign of the actual mean. For example, only 38.35 per cent of day 0 impacts for buys were negative while 55.95 per cent of day 0 sales impacts were negative.

A price impact of .0046 (i.e. day 0 buys) can be interpreted to mean that at the close on that particular day, on average, prices for stocks block traded were .46 per cent higher than at the close the day before. A price impact of -.0028 means that prices were .28 per cent lower. As described in Chapter 5 the price movements have been adjusted for market trends, dividends, splits, etc.

Examining column 4, the standard error, of these two tables it is apparent that the largest deviation is experienced about day 0 means impacts which leads to 95 per cent confidence intervals about the means of .24 per cent for buys and .26 per cent for sells, as reported above. The next highest standard error for buys is associated with day +3 where the reported mean of .0002 can be expected (at the .95 level) to lie within .0011 and -.0007, an interval of .18 per cent, while for the lowest standard error (day -6 and +6)
the mean lies between .0005 and -.0009 an interval of only .14 per cent. For sales the next highest standard error is at day +12 yielding an interval of .22 per cent while the lowest standard error (for days -15 and -7) produces an interval of .18 per cent.

Column 5, in both tables, gives the standard deviation for the distribution of the daily impacts. This statistic is useful for determining the probable range of individual observations as was done when discussing intra day results. The interesting result here is that the standard deviation associated with day 0 impacts is consistently larger than for any other day.\(^1\) In Table 6-3 the day 0 standard deviation of .0238 means that for every 200 trades we would expect at least 5 trades with impacts above 5.12% and at least 5 trades with impacts less than -4.20%. This can be contrasted with the next highest standard deviation of .0189 on day +3. Here we would expect at least 5 impacts above 3.72% and at least 5 below -3.68%. For the lowest standard deviation (.0144 on day -6) the corresponding figures would be 2.78% and -2.82%. In Table 6-4 the day 0 figures are +4.13% and -4.68% while the next highest standard deviation at day +12 produces an expectation of at least 5 impacts in every 200 to exceed 3.76% and at least 5 impacts to fall below -3.64%. For the lowest standard deviation (.0150 for day -15) we would expect, at the .95 level, 5 impacts over 2.88% and 5 less than -2.92%.

\(^1\)With sample sizes over 500 a difference of only .0001 between standard deviations is significant at the .99 level.
These significant differences indicate that not only the largest impacts occur on the block day but also the largest variability in the individual impacts also occurs on the block day.

Analysis of daily price impacts is facilitated by plotting the values shown in column 2 of Tables 6-3 and 6-4. Figures 6-1 and 6-2 are scatter diagrams of these two sets of daily price impacts and offer a graphic display of the daily mean impacts. In both cases the impact for the block day stands out prominently from the non block daily impacts.

Test 3: Price Impact Index

Interpretation of these data is facilitated by examining a plot of the cumulative effect of these impacts. Columns 6 of Tables 6-3 and 6-4 give cumulative figures. It should be noted that the standard error of these cumulative figures (column 7) increases steadily from day -15 to day +15 and hence less reliance should be placed on such cumulative results. Nevertheless a plot of these figures sheds a good deal of light on the underlying process. Figures 6-3 and 6-4 are price impact index plots for all buys and all sells respectively.

Figure 6-3 can be considered in three parts. Days -15 and -1 indicate that prices preceding block purchases tend to be slightly higher than normal relative to the mar-
FIGURE 6-1

31 DAY PRICE IMPACT PLOT

Sample Description: All Trades Classified as Buys

Number of Different Stocks: 180
Mean Beta: 1.06
Number of trades: 1541

Daily Price Impact (%)
Figure 6-2

31 Day Price Impact Plot

Sample Description: All Trades Classified as Sells

Number of Different Stocks: 167
Mean Beta: 1.08
Number of trades: 1092

Daily Price Impact (%)
FIGURE 6-3

31 DAY PRICE IMPACT INDEX

Sample Description: All Buys

Number of Different Stocks: 1.80
Mean Beta: 1.06
Number of trades: 1541

Impact Index

Day
FIGURE 6-4

31 DAY PRICE IMPACT INDEX

Sample Description: All Sells

Number of Different Stocks: 167
Mean Beta: 1.08
Number of trades: 1092
ket as a whole. Immediately before the block, prices tend to be even higher than at any time in this first period. Days 0 to +4, the five day period when blocks may trade, indicate a rapid price appreciation of about 1.8 per cent, most of which occurs on day 0. The index from days +4 to +15 does not drop, indicating that the price change associated with block purchases are "permanent" in nature. This result adds further confirmation to H3.

For sales (Figure 6-4) the most striking feature is the lack of any impact. Prices are relatively strong from day -15 to day -1, then there is a drop of about .5 per cent during days 0 and +1. After a seven day period of no movement, prices tend to recover and by day +15 they are slightly higher than on day -1. These results best support H1, the substitution hypothesis which predicts little or no impact.

At this stage based on results from applying the three price impact tests to all buys and all sells we seem to have found consistent support for H3 insofar as buys are concerned. Results for sales are less clear-cut but seem to favor H1 or H2. To clarify the situation we move on to the auxiliary hypotheses testing.

Value Effects: Auxiliary Hypotheses H1A1, H2A1, H3A1

The next stage of testing involved the repetition of tests 1 to 3 on trades classified into various value cate-
gories in order to determine if there is a relationship between the value of the transaction and the associated price impact. Table 6-5 shows the results of test 1 applied to the five value classifications developed in Chapter 5, for trades classified as buys.

**TABLE 6-5**

**INTRA DAY RESULTS BY VALUE CLASS FOR BUYS**

(line headings are abbreviated from Table 6-1)

<table>
<thead>
<tr>
<th>LINE</th>
<th>VALUE CLASS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From $100k</td>
<td>$175k</td>
<td>$250k</td>
<td>$500k</td>
<td>over</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To $175k</td>
<td>$250k</td>
<td>$500k</td>
<td>$1 million</td>
<td>$1 million</td>
<td></td>
</tr>
<tr>
<td>Sample size</td>
<td>1038</td>
<td>243</td>
<td>190</td>
<td>58</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>1 Close to blick (%)</td>
<td>.221</td>
<td>.237</td>
<td>.754</td>
<td>-1.91</td>
<td>2.62</td>
<td></td>
</tr>
<tr>
<td>2 B lick to close (%)</td>
<td>.213</td>
<td>.307</td>
<td>-.733</td>
<td>2.63</td>
<td>-1.15</td>
<td></td>
</tr>
<tr>
<td>3 Net change (%)</td>
<td>.434</td>
<td>.544</td>
<td>.021</td>
<td>.712</td>
<td>1.47</td>
<td></td>
</tr>
<tr>
<td>4 Index change (%)</td>
<td>-.031</td>
<td>-.081</td>
<td>-.097</td>
<td>.099</td>
<td>.035</td>
<td></td>
</tr>
<tr>
<td>Std. error line 3</td>
<td>.146</td>
<td>.208</td>
<td>.739</td>
<td>1.507</td>
<td>.656</td>
<td></td>
</tr>
<tr>
<td>Std. Dev. Line 3</td>
<td>4.54</td>
<td>3.10</td>
<td>10.33</td>
<td>11.35</td>
<td>2.17</td>
<td></td>
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</tbody>
</table>

Line 3 of the table indicates a generally positive relationship between value of the trade and the net intra day effect although the pattern found for classes 3 to 5 is at variance with the total effect reported in the previous section and the observed effect for class 1 and 2 trades. The hypothesis that the means reported in row 3 are the same could not be rejected at the .95 significance level when the different variances in the samples were taken into account. The variances were, however, found to be significantly different. Variances for classes 1 and 2 were different to all other classes and
each other at the .95 level, but variances for classes 3 and 4 were not.

Comparing not just the day of the block impacts, but all 31 daily impacts for the 5 value classifications via analysis of variance, (see Chapter 5 for a detailed description of this test) failed to find any difference above the .75 significance level. The net effect of these tests is support for H3A1 which predicts no relationship between value and price impacts. Support for H3A1 in turn supports H3.

For sales the pattern is a bit more definite and the general findings indicate a positive relationship between value and price impacts. Table 6-6 shows intra day effects for sales.

**TABLE 6-6**

<table>
<thead>
<tr>
<th>LINE</th>
</tr>
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<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>From $100k</td>
</tr>
<tr>
<td>1 Close to block (%)</td>
</tr>
<tr>
<td>2 Block to close (%)</td>
</tr>
<tr>
<td>3 Net change (%)</td>
</tr>
<tr>
<td>4 Index change (%)</td>
</tr>
<tr>
<td>Std. Dev. line 3</td>
</tr>
<tr>
<td>Std. error line 3</td>
</tr>
</tbody>
</table>

Line 3 of the table indicates an almost consistent and
positive relationship between the magnitude of the price impact and the value of the trade. In this case, unlike the situation for buys, both means and variances were found to be significantly different to each other at the .95 level. Standard errors again appear directly related to value class, but the rather large errors for class 1 sales is a deviant observation to this trend, as is the distinctly different pattern between the close to block and block to close price measurements for this class.

An analysis using analysis of variance (ANOVAR) indicated a strong significant difference (.99 significance level) between the means of the daily price impacts of the 5 value categories.

Again there appears to be a definite relationship between the standard errors and the value class for day 0 impacts. As with those reported in Tables 6-3 and 6-4, day 0 impacts are statistically larger than errors for other days in the study period, and they increase with the value class as shown.

<table>
<thead>
<tr>
<th>Value Class</th>
<th>Standard Error</th>
<th>Standard Deviation</th>
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<tbody>
<tr>
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<td>3</td>
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<td>.0192</td>
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</table>

Overall, results of testing the first auxiliary hypothesis differ for buys and sells. For buys there is little evidence of any relationship, but for sells a positive
A relationship was found.

**Effects of Time to Trade:**

**Auxiliary Hypotheses H1A2, H2A2, H3A2**

Testing of the second set of auxiliary hypotheses, namely the relationship between the time to trade and the price impact, failed to produce any significant differences for either buys or sells. That is to say there were no trends discerned in the patterns of intra day impacts over the 5 time classifications, and the second test, i.e. the comparison of all 31 daily price impacts for each time to trade class using ANOVAR, also failed to find any statistically significant differences. Even standard errors associated with day 0 impacts did not exhibit any relationship with the time the trade took, as shown.

<table>
<thead>
<tr>
<th>Duration of Trade</th>
<th>Standard Error Buys</th>
<th>Standard Error Sells</th>
<th>Standard Deviation Buys</th>
<th>Standard Deviation Sells</th>
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<td>3 days</td>
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<td>4 days</td>
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<td>.0171</td>
<td>.0178</td>
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</table>

For buys, however, there was some indication that larger price impacts are associated with 5 day trades than for 1 day trades. Figures 6-5 and 6-6 on the next two pages plot the price impact index for all buys that took only 1 day and all buys that took 5 days respectively.

It is interesting to note the rather large impact on the last day of the five day trading period\(^1\) shown in Figure

---

\(^1\)The last day of the five day trading period is day +4 the five days being shown as days 0, 1, 2, 3, 4 on Figures 6-5, 6-6 and all others like them.
FIGURE 6-5

31 DAY PRICE IMPACT INDEX

Sample Description: All One Day Buys

Number of Different Stocks: 133
Mean Beta: 1.06
Number of trades: 834

Price Impact Index

Day
FIGURE 6-6

31 DAY PRICE IMPACT INDEX

Sample Description: All Five Day Buys

Number of Different Stocks: 83
Mean Beta: 1.03
Number of trades: 147

Price Impact Index

5 day trades: x
1 day trades: .---.

5 day trading period

Day
6-6. This price impact of about .30 per cent could indicate buying pressure on the last day in order to complete a trade within the five day limit and thus qualify for the volume rebate.\(^1\) The fifth day price rise is almost exactly equivalent to the commission rebate earned on trades of $100,000 to $249,999. These patterns were not evident for block trades classified as sales.

In Figure 6-6 the plot for one day trades from Figure 6-5 is superimposed over the plot for 5 day trades (the dotted line). The plot emphasizes the temporary liquidity effect associated with 5 day trading in that the 5 day plot rises about .4 per cent more than one day trades, the plot then shows falling prices until day +12, and then rising prices again ending up on day +15 at about the same level as one day trades. These results imply that there is an extra cost, at least equivalent to the minimum volume rebate, for trading over the full 5 day period. This extra cost, however, applies only to the marginal amount of stock traded in the last days. For example, if a customer buys $90,000 of a stock in day 1, buying an extra $10,000 on or before day 5 will result in a 33 per cent commission reduction.\(^2\)

---

\(^1\) Interviews with institutional traders indicate that brokers commonly encourage them to buy more on the fifth day and qualify for the volume discount.

\(^2\) Provided the trade meets the other volume discount requirements.
Clearly he can afford to pay a premium on this last $10,000 (in this case up to 3 per cent) and still break even. Before passing judgement on whether or not the five day rule is beneficial we must know how much of the trading of 5 day trades is carried out on day 5 versus day 1. Should it turn out that the bulk of the trading occurs on day 1 institutions are probably making good use of the rule, but if most of the trading is done on the fifth day liquidity costs are probably wiping out any savings realized through the volume discount.

Figure 6-7 is a plot of the volume impact index for 5 day trades. From this chart it is immediately evident that most of the trading occurs on days 1 and 2. Day 5 trading exceeds day 4 trading but it is only about one quarter of day 1 trading. Approximate percentages traded are:

- First day 50%
- Second day 26%
- Third day 6%
- Fourth day 6%
- Fifth day 12%

While these figures are only averages for many trades they imply that in general institutions probably benefit from the five day rule as only marginal trading appears to be done after day 2. This points out the possibility that a five day period may be unnecessarily long and unless the low volume trading on days 3 and 4 accompanied by positive price impacts indicates that the market is saturated, it
FIGURE 6-7

31 DAY VOLUME IMPACT INDEX

Sample Description: All Five Day Buys

Number of Different Stocks: 83
Mean Beta: 1.03
Number of Trades: 147

Volume Impact Index

5 day period

Day
seems a 3 day period should suffice. The disadvantage to
trading over a 5 day period as opposed to a 3 day period is
the steady advance in price from days 2 to 5.

Effect of Institutional Interest:
Auxiliary Hypotheses H1A3, H2A3, H3A3

The third set of auxiliary hypotheses involved the
relationship between the institutional interest in a stock
and the price impact. Results for the top 10 institutional
interest stocks (as classified by the method developed in
Chapter 5) versus the bottom 50 institutional interest
stocks yielded significant results for both buys and sells.

For buys, price impacts were virtually non-existent
for the high interest group (see Figure 6-8) while a
cumulative impact of almost 6 per cent was found to be
associated with block trades in the 50 lowest interest
stocks. A price impact index plot for this group of stocks
is shown in Figure 6-9.

In this case it appears that the price impact is
inversely related to institutional interest. For high insti-
tutional interest stocks we would expect to obtain small
impacts, for low interest stocks we would expect large impacts.
Examining the day 0 impacts for the various samples tested
indicates that this relationship clearly holds between ends of
the classification. Standard errors are also significantly
different (.99 level) for the two groups of stocks,
and a similar trend holds for sells. This implies that
FIGURE 6-8

31 DAY PRICE IMPACT INDEX

Sample Description: BUYS: Top 10 Institutional Interest Stocks

Number of Different Stocks: 10
Mean Beta: 1.09
Number of trades: 316

Price Impact Index

Day
FIGURE 6-9

31 DAY PRICE IMPACT INDEX

Sample Description: BUYS: Bottom 50 Institutional Interest Stocks
Number of Different Stocks: 33—(This number differs from 50 because 17 of the bottom 50 stocks had no trades which were classified as buys.)
Mean Beta: .96
Number of trades: 55
impacts for the low interest groups tend to be both larger and more varied. For example, we would expect 2.5 of every hundred low institutional interest stock impacts to exceed 13.1 per cent on day 0 alone.¹

<table>
<thead>
<tr>
<th>Sample</th>
<th>Day 0 impact</th>
<th>Std. Error</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 5 Institutional Stocks</td>
<td>.0036</td>
<td>.00105</td>
<td>.0131</td>
</tr>
<tr>
<td>Top 10 &quot;</td>
<td>.0024</td>
<td>.00114</td>
<td>.0143</td>
</tr>
<tr>
<td>Top 25 &quot;</td>
<td>.0039</td>
<td>.00085</td>
<td>.0220</td>
</tr>
<tr>
<td>Bottom 50 &quot;</td>
<td>.0199</td>
<td>.00738</td>
<td>.0553</td>
</tr>
<tr>
<td>Bottom 75 &quot;</td>
<td>.0173</td>
<td>.00306</td>
<td>.0429</td>
</tr>
</tbody>
</table>

The drop in price after day +2 in Figure 6-8 is surprising because one might expect buying pressure over at least the five day trading period (days 0 to +4). Examining the samples, however, reveals a tendency for high institutional interest stock trades to be completed in one or two days rather than extending over the full five day period. The converse of this doesn't appear to be true for low interest stocks as indicated by the day +4 drop in the index plot shown in Figure 6-9.²

For sales the impact index plot for the top 10 stocks indicated a steady price decrease up to and including the days of the trade. Prices recovered somewhat after the trade, steadying after day +8 at about a 2 per cent discount (see Figure 6-10). For the top 25 stocks prices dropped by about 1 per cent recovering completely by day +12. (See Figure 6-11).

For both these impact patterns a liquidity effect is

¹(1.96 x .0553) + 0.0199.

²The similarity in the mean beta values for the various samples, which are reported in Figures 6-1 to 6-17, indicate that the portfolios have similar risk profiles.
31 DAY PRICE IMPACT INDEX

Sample Description: SALES: Top 10 Institutional Interest Stocks

Number of Different Stocks: 10
Mean Beta: 1.11
Number of trades: 226

Price Impact Index

Day
Figure 6-11

31-Day Price Impact Index

Sample Description: Sales: Top 25 Institutional Interest Stocks

Number of Different Stocks: 25
Mean Beta: 1.04
Number of trades: 471

Price Impact Index

Day
observed. In Figure 6-10 prices decline about 1.8 per cent before the trading period begins, decline a further .6 per cent during the trading period and then recover over the next five days regaining almost all of the price drop associated with the trade. The 1.8 per cent drop in price can be interested to mean that only after prices have decreased by this amount is enough buying interest developed to enable block trading.

Price impact indexes for sales of stocks with the least institutional interest revealed an entirely opposite effect. Figure 6-12 for the bottom 50 institutional stocks indicates that block selling was associated with a "permanent" price increase of about 6 per cent starting day -9 and ending day +5. From results for purchases we would expect greater price decreases to be associated with low institutional interest stocks than with high institutional interest stocks. Figure 6-12 presents such surprising results that impact indexes for larger samples were investigated to check the stability of the process. Figures 6-13 and 6-14 for the bottom 75 and 125 stocks respectively indicate that the magnitude of the price increase with block sales decreases rapidly but the pattern is quite consistent.

In each of the 3 Figures most of the price advance occurs before the block trade, and in all cases a small
FIGURE 6-12
31 DAY PRICE IMPACT INDEX

Sample Description: SALES: Bottom 50 Institutional Interest Stocks

Number of Different Stocks: 29
Mean Beta: .97
Number of trades: 50

Price Impact Index

Day
31 DAY PRICE IMPACT INDEX

Sample Description: SALES: Bottom 75 Institutional Interest Stocks

Number of Different Stocks: 43
Mean Beta: .96
Number of trades: 80

Price Impact Index

Day

0.960
1.000
1.020
1.040
1.060
1.080
FIGURE 6-14

31 DAY PRICE IMPACT INDEX

Sample Description: SALES: Bottom 125 Institutional Interest Stocks
Number of Different Stocks: 84
Mean Beta: 1.08
Number of trades: 173

Price Impact Index

0.600

0.650

0.700

0.750

0.800

0.850

0.900

0.950

1.000

1.050

1.100

1.150

1.200

1.250

1.300

1.350

1.400

1.450

1.500

Day
negative impact occurs at the actual time of the trade. Post trade price trends are relatively level.

These results could indicate that a rise in price of low institutional interest stocks triggers block selling. This selling, however, halts the price advance but does not force the price down except for a one to three day period immediately around day 0. A behavioural explanation for why this may be so is given in the next chapter.

Volume effects:
Auxiliary Hypotheses H1A4, H2A4, H3A4

The fourth and final series of hypotheses deal with volume effects associated with large value transactions. Figures 6-15 and 6-16 are 31 day volume impact index plots for all buys and all sells respectively.

Both graphs indicate that block trading seems to occur during periods of relatively high volume for the stock involved, and volumes on the block day are some ten times normal. However, part of the day 0 impact is due to the block itself. Block buys averaged 9,148 shares on day 0\(^1\) while the average volume on the day of the block was 14,761 shares, hence 62.0 per cent of the day 0 impact was due to the block itself. For sales 71.3 per cent (9,343/13,102)

\(^{1}\)This average and the average reported for sales is for trades that were completed on day 0 only, i.e. one day trades.
FIGURE 6-15

31 DAY VOLUME IMPACT INDEX

Sample Description: All Buys

Number of Different Stocks: 180
Mean Beta: 1.06
Number of trades: 1540

Volume Impact Index

adjusted for the trade

Day

10.000
8.000
6.000
4.000
2.000
1.000
0.000
15,000
12,000
9,000
6,000
3,000
0,000
FIGURE 6-16
31 DAY VOLUME IMPACT INDEX

Sample Description: All Sells
Number of Different Stocks: 167
Mean Beta: 1.08
Number of trades: 1091
was due to the block itself. Figures 6-16 and 6-15 illustrate these adjusted levels. The graphs both report a higher than normal volume associated with block trading. This occurs both before and after the block day while on the block day and during the 5 day block trading period the volume impact levels tend to be the highest for the 31 day period.

The extended nature of these volume impacts tend to support H3A4, the information effect hypothesis. Under this hypothesis we would expect many shares of stock to change hands during the period around the trade as investors adjust their portfolios in light of new information about the stock. A clear example of this effect is a plot of the volume impact index for all buys over $1 million\(^1\) shown as Figure 6-17. We see a period of normal volume up to day -4, minor positive impacts from days -4 to -1 and then strong impacts for the entire remaining period. It is apparent here that the block trade was associated with a large positive impact but post block trading in the market was at times almost as high indicating a large degree of portfolio adjustment. The possibility also exists that high volume in a stock is the trigger that instigates block trading. In other words when volume is high block trading becomes feasible. The fact that volume tended to be high right from day -15 tends to support this explanation. Further testing along these

\(^1\)The small sample size, however, means that generalizations cannot be confidently made.
FIGURE 6-17

31 DAY VOLUME IMPACT INDEX

Sample Description: All buys over $1 million

Number of Different Stocks: 8
Mean Beta: 1.15
Number of Trades: 12
lines is discussed in the next section.

It is interesting to speculate about the large volumes on days -12 and -10 in Figure 6-15 and day -11 in Figure 6-16. Referring back to Figure 6-3 we can see that purchases in this period stand ready to benefit from the almost 2 percent price increase which materializes by day +3. An investigation was made to determine if this high volume period consistently appeared in other samples. For both buys and sells this period did not exhibit any consistent pattern.

It is very likely that the high volumes in this period about two weeks before purchases, are due to other blocks trading. This implies that blocks cluster or bunch\(^1\) in two week periods. It is difficult to suggest a reason why active block trading in one period might be associated with active trading approximately two weeks later, and then why there does not appear to be active trading in the next period two weeks later, i.e. days +9 to +13.

A further enigma is the high volume impact for day 4 sales. One would expect, if anything, a higher impact on day five when traders complete their orders to qualify for the volume discount. Unfortunately it is impossible to ad-

\(^1\)Formal tests for serial dependence were not carried out here. K & S (as reported in Chapter 2) found some clustering of blocks for uptick trades only, and some weak positive serial dependence. They found, however, that blocks tended to cluster in the 10 day period after the trade, not before the trade.
just the fourth day results for the impact of the trade itself as the data is not reported on a per day basis for multi-day trades, hence for a particular trade we know only the total amount traded and the number of days it took.\(^1\) It is possible that 4 and 5 day trades were, for some reason, executed primarily on the fourth day, leading to the large impact. Again it is difficult to imagine why this might be the case, and Figure 6-7 doesn't support this explanation.

Volume impacts for the two classifications of institutional interest stocks exhibited significantly different results. For the high interest group hardly any impact (about 3 times normal) was found whereas for the low interest group impacts of 25 times normal and 30 times normal for sells and buys respectively were associated with block trades. Post day +4 trading volumes tended to fall off quite rapidly, however, remaining about 2 to 4 times normal for low interest stocks and 1 to 2 times normal for high interest stocks.

**Additional Testing:**

**Period Effects**

It will be recalled (from Chapter 5) that the block trading sample was made up of 9 sample periods which represented different combinations of price trends up, down or flat while volume was high, low or medium. The possibility

\(^1\) Of course we were able to adjust for one day trades.
that price impacts for the various periods could differ was tested.

These tests involved calculating 31 day impacts for each of the 9 separate periods, for both buys and sells (18 tests in all). Table 6-7 gives portfolio statistics for each of the 18 different test portfolios. No systematic relationships between periods are apparent except that periods classified as high volume have more trades. These totals are shown at the bottom of Table 6-7.

An analysis using ANOVAR comparing all 9 periods for both buys and sells was carried out in a manner exactly analogous to the test technique used to compare value and time classifications. For sales no significant differences between the mean daily price impacts for the 9 periods was found. For buys the means were found to be different but only at the .75 significance level, a difference possibly attributable to the large (.0125) impact for day 0 in period 5 (high volume and rising prices).

This impact appears to be inconsistent with other high volume impacts which tend to be low. Our expectation would be that if there is any trend we should find higher impacts for low volume, prices falling periods (i.e. the lower right hand corner of Table 6-7) than for high volumes and price rising (i.e. the upper left hand corner of Table 6-7). This expectation, for the most part, is born out. However, dividing each of the nine periods into buys and sells results
TABLE 6-7
Price and Volume Characteristics, Portfolio Statistics and Day 0 Impacts for the 9 Sample Periods

<table>
<thead>
<tr>
<th></th>
<th>HIGH</th>
<th>MEDIUM</th>
<th>LOW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Buys</td>
<td>Sells</td>
<td>Buys</td>
</tr>
<tr>
<td>PERIOD</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>STOCKS</td>
<td>58</td>
<td>48</td>
<td>85</td>
</tr>
<tr>
<td>TRADES</td>
<td>182</td>
<td>101</td>
<td>273</td>
</tr>
<tr>
<td>BETA</td>
<td>1.09</td>
<td>1.02</td>
<td>1.08</td>
</tr>
<tr>
<td>IMPACT</td>
<td>.0125</td>
<td>.0033</td>
<td>.0070</td>
</tr>
<tr>
<td>PERIOD</td>
<td>6</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>STOCKS</td>
<td>69</td>
<td>58</td>
<td>49</td>
</tr>
<tr>
<td>TRADES</td>
<td>179</td>
<td>148</td>
<td>137</td>
</tr>
<tr>
<td>BETA</td>
<td>1.00</td>
<td>1.04</td>
<td>1.05</td>
</tr>
<tr>
<td>IMPACT</td>
<td>.0043</td>
<td>.0003</td>
<td>.0003</td>
</tr>
<tr>
<td>PERIOD</td>
<td>8</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>STOCKS</td>
<td>83</td>
<td>68</td>
<td>49</td>
</tr>
<tr>
<td>TRADES</td>
<td>270</td>
<td>167</td>
<td>125</td>
</tr>
<tr>
<td>BETA</td>
<td>1.10</td>
<td>1.11</td>
<td>1.05</td>
</tr>
<tr>
<td>IMPACT</td>
<td>.0004</td>
<td>.0004</td>
<td>.0022</td>
</tr>
</tbody>
</table>

Total # of Trades: 631 416 535 361 387 316
in small sample sizes which means, when coupled with the fact that sample variances are similar, that these individual results are not significantly different.

Results of the period testing indicate that the individual samples are drawn from the same population which confirms the statistical legitimacy of combining all the individual samples for aggregate testing. There is, however, some indication that block trading activity is positively related to the general activity of the market. In other words blocks tend to move when general market volumes are high.

**Summary**

Price impacts for our sample of large value transactions were calculated and the results presented in this chapter. The overall impact for buys tended to be about a 2 per cent price increase over the period day -6 to +3 which did not recover, while for sales only a small negative impact, less than .5 per cent, was discovered. This impact was of a short duration only.

Further testing uncovered no significant relationship between value of the trade and the price impact for buys, but a positive relationship was found in the case of sells. For the time variable no significant relationships were found for either buys or sells, but impacts associated with 5 day buys lead to implications with respect to the volume discount rules.
Classifying stocks in terms of relative institutional interest and comparing price impacts for high versus low interest groups produced very significant differences although in the case of sales the results were not in the direction expected. Volume impacts indicate that a period of abnormally high activity precedes and follows large volume transactions.

Chapter 7 which follows concludes this thesis by discussing the results of this chapter in terms of the theory and hypotheses introduced in Chapters 3 and 4, drawing out the implications of these results and finally offering suggestions for further research.
CHAPTER 7

CONCLUSIONS, IMPLICATIONS, AND SUGGESTIONS FOR FURTHER WORK

This chapter begins by presenting a summary of the previous chapter's findings in tabular form. From these results conclusions are drawn with reference to our research hypotheses and theoretical model. Next the implications of these conclusions for institutional investors, the public, brokers, and the stock exchanges are discussed. Finally suggestions for further work are made.

Summary of Results

In all, seven different tests were carried out on the sample of large value transactions, both for trades classified as buys and those classified as sells. Tables 7-1 for buys and 7-2 for sells list these tests together with their results as described previously in Chapter 6. The third column of the tables briefly presents conclusions, if any, indicated by the individual tests.

Conclusions
For Trades Classified as Buys

Conclusions based on the seven tests applied to all trades classified as buys seem to consistently support H3,
### TABLE 7-1

**SUMMARY OF RESULTS OF TESTING TRADES CLASSIFIED AS BUYS**

<table>
<thead>
<tr>
<th>TEST</th>
<th>RESULTS</th>
<th>CONCLUSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intra day impacts:</td>
<td>Positive effect before block confirmed by a positive effect after.</td>
<td>No price recovery indicates support for H3.a</td>
</tr>
<tr>
<td>2. Daily impacts:</td>
<td>Impacts tend to be +ve especially around day 0 when largest impact occurs.</td>
<td>Supports H3.</td>
</tr>
<tr>
<td>3. Impact Index:</td>
<td>Prices relatively high before day 0, price effect after is &quot;permanent&quot;.</td>
<td>Supports H3.</td>
</tr>
<tr>
<td>5. Time to trade vs. impact:</td>
<td>No relationship.</td>
<td>Supports H3 &amp; H1.</td>
</tr>
<tr>
<td>impact:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Volume impacts:</td>
<td>High volume both before and after day 0.</td>
<td>Prolonged active trading supports H3.</td>
</tr>
</tbody>
</table>

aH3 is the Information Effect Hypothesis.

bH2 is the Liquidity or Price Pressure hypothesis. (See Chapter 4 for a detailed description of these hypotheses.)
<table>
<thead>
<tr>
<th>TEST</th>
<th>RESULTS</th>
<th>CONCLUSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intra day</td>
<td>Negative effect before block with an 18% recovery after the block</td>
<td>Price recovery supports H2.</td>
</tr>
<tr>
<td>impacts:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Daily impacts:</td>
<td>Impacts small but well scattered -ve tendency around day 0, which is largest impact.</td>
<td>Supports H1(^a) and or H2.</td>
</tr>
<tr>
<td>3. Impact index:</td>
<td>Price drops at day 0 but magnitude is small and there is a full recovery by day +10.</td>
<td>Supports H2, and to some extent H1.</td>
</tr>
<tr>
<td>5. Time to trade vs.</td>
<td>No relationship.</td>
<td>Supports H3 &amp; H1.</td>
</tr>
<tr>
<td>impact:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Institutional</td>
<td>1-2% negative impact for high interest stocks, 2-6% positive impact for low interest stocks.</td>
<td>Supports H2 and H3.</td>
</tr>
<tr>
<td>interest vs. impact:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Volume impacts:</td>
<td>High volumes both before and after day 0 but always less than those for buys.</td>
<td>Prolonged active trading supports H3 but only weakly.</td>
</tr>
</tbody>
</table>

\(^a\)H1 is the Substitution Effect Hypothesis (see Chapter 4).
the information effect hypothesis. There appears to be a definite and significant price increase associated with block buying, and this increase is not reversed in at least the next 15 trading days. Moreover, this price change seems to be independent of the value of the trade and the time it took to trade, and has associated with it relatively high volumes both before and after the trade. There does, however, seem to be a liquidity factor in that the price impact was found to be negatively related to the relative institutional interest in a stock. This means that price impacts for institutional favourites tended to be less than those for stocks with little institutional interest.

In terms of the functional model developed in Chapter 3 (equation 3.11) we find that the price impact is a function of only the institutional interest (Ia) variable. Volume appears to be a conditional variable, i.e. block trading is associated with periods of relatively high volume, but there appears to be no evidence linking volume directly with price impacts. We cannot, for example, say that during periods of high volume impacts are less.

Support of H3 implies that the price effect associated with block purchases is due to a fundamental change in the value the market places on a particular stock, in this case an upward change. New information has reached the market, and the price adjusted upward. The new information could have triggered the block purchases associated with the price
increase (and it is likely that the block trades themselves were regarded as information) leading to widespread portfolio adjustments. That there are widespread portfolio adjustments is born out by the long duration of positive volume impacts.

For Trades Classified as Sells

On balance, conclusions derived from price impact testing of block trades that were classified as sells tend to support the liquidity payment hypothesis, H2. This conclusion is based mainly on the recovery in price witnessed both on the day of the block (test 1) and in the period after the block (test 2). Contrary evidence supporting H3 is the lack of any relationship between the time to trade and price impacts, while the overall observation that price impacts for sales tended to be small (i.e. about one half of one per cent on day 0) tends to support the substitution effect hypothesis, H1.

The relationship between institutional interest and the price impacts lead to conflicting conclusions. Price impact indexes for both low and high institutional interest groups resemble the "permanent price effect" plots common to H3. However, the fact that the price impact is related to institutional interest is contrary to H3 in that the impact should be related only to the information content. This finding can also be interpreted to support H3 when it is realized that the trade itself can be considered as
information. Block trades in high institutional interest stocks are common and expected, hence little information might be associated with such trading by the market. Block trades in low interest stocks are less common and investors could treat them as much more significant information, hence larger impacts result. Volume also tends to support H3 but here the highest volume impact was considerably lower than corresponding volume impacts for buys, indicating relatively less support for H3.

Conclusions with respect to equation 3.11 are consistent with those for buys, namely that price impacts seem to be a function of institutional interest. Impacts for low interest stocks exceed those for high interest stocks as before, but for sales low interest stocks had positive impacts while high interest stocks had negative impacts. Volume again appears to be a conditional variable.

Support for H1 implies that price impacts are small because stocks are good substitutes one for another, hence when price drops even a small amount, investors switch creating heavy buying and upward pressure on price. Support for H2 implies that there is a liquidity cost to trading large values of a stock. These costs take the form of temporary price impacts. For our sample of sales, the small and temporary impacts indicate support for both H1 and H2 as is evident from Table 7-2.
The large sample sizes used in almost all testing lead to tight confidence intervals about the true mean for the various price impacts. Mean values as reported above tended to be small but testing the distribution of individual price impacts from the sample distributions revealed a wider spread in observations. For buys, 95 per cent of the individual day 0 impacts could be expected to fall within a range of -6% to +7% while 98 per cent could be expected to fall between -7.4% and +8.3%. For sales, the intervals were larger, namely, 95 per cent between -13% and +12% and 98 per cent between -15% and +14%. Day 0 impacts consistently had a higher variance associated with their distributions than impacts for any other day in the 31 day analytic period.

These distributions also tended to widen as the value of the trades in the samples increased, indicating that a greater range of individual impacts can be expected for larger trades. Interestingly enough, however, these distributions did not vary with the duration of the trades. For the type of stock under consideration significant differences were found when the distributions of impacts in low institutional interest stocks were compared to those for high institutional interest stocks. The variance for the low interest group always exceeded the variance in the distributions of price impacts for high interest stocks which implies that institutional investors can be less confident about the possible magnitudes of impacts associated with block trading these stocks.
Buys Versus Sells

It is of interest that results for trades classified as buys consistently differ from those classified as sells. One can only speculate as to the underlying causes that may account for these differences but it seems clear that institutional investors buy and sell for different reasons. The results seem to imply that the market regards block purchases as being associated with more information than block sales. This could be because institutional purchases are made only in anticipation of a profitable investment whereas sells can be instigated by a number of factors. For example an institution could sell a particular security to meet cash requirements, or to enable it to purchase another security, or any number of reasons.

At any rate, results for buys consistently support H3, the information effect hypothesis, while results for sells do not. Extending this implication further to the realm of advising the institutional investor, one could recommend that for purchases an investor should act as quickly as possible because price changes associated with large transactions are likely to be reflected in "permanently" established new levels of market price. For sells, on the other hand, timing is less important as no "permanent" price changes are expected. Overall it appears that the market might attribute less information content to institutional sells.
Further Conclusions and Implications

While the above section considered the results obtained with reference to our research hypotheses and theoretical model it is important to restructure and elaborate these results with reference to the various interest groups who are involved with or affected by large value trading. This section examines the findings in this light.

For Institutional Investors

For institutional investors the prime overall result is the generally small magnitude of price impacts that were found to be associated with block trading. This implies that there is little price handicap in trading large volumes. Price declines associated with sales were about .5 per cent, less than one commission even after the volume discount. For buys a 2 per cent impact was found but this cost was fully compensated for by a general price increase in the stocks purchased.

While the above results hold true for the sample average larger impacts were found to be associated with low institutional interest stocks. Here both buys and sells resulted in a 4 to 6 per cent positive impact.

In terms of timing it appears that institutional purchases are made when the stock price is relatively high, at least for the six week period studied, but the same holds
true for sales. The sales impact index graph (Figure 6-4) shows that while a negative impact occurs at day 0 the stock price is generally high before selling. Selling of high institutional interest stocks, however, seems to be associated with declining relative prices. In this case (Figures 6-10 and 6-11) it is not until after day 0, i.e. after the large value selling, that prices stabilize. For low institutional interest stocks institutions in general appear to sell only after substantial price increases (6 per cent for the bottom 50 institutional interest stocks).

This could imply that low institutional interest stocks are block traded only when the price is relatively high, being traded slowly in many small transactions otherwise. Also the different price impact patterns for high and low institutional interest stocks could imply that institutions do not hesitate to sell high interest stocks for cash requirements, as their expectations are that it is easy to do so and relatively inexpensive. The low institutional interest stocks, on the other hand, are watched very carefully and sold only when the price is appreciating.

Another possible explanation for the diverse price impacts for sales in low and high interest stocks is that the classification scheme used to differentiate between buys and sells fails to identify sells correctly, hence the unexpected results. Fortunately there is good evidence which can be used to refute this argument. The evidence is
the consistent finding that all price impact indexes for sales reveal a negative impact around day 0, even in the case of low institutional interest stocks where the overall effect is a 6 per cent price increase. This increase occurs before day 0, while around day 0 itself there is in fact a .25 per cent price decline (see Figure 6-12).

For the Public

To the extent that block trading on Canada's two major stock exchanges does not seem to be associated with large price changes there is no social cost to that segment of the general public which is indirectly involved in this activity through participation in pension funds, etc. Given that other benefits arising from the institutionalization of the savings function outweigh these small price effects, there should be a net social benefit to this practise.

For the Exchanges

Overall, based on the small impacts found, we can conclude that the stock exchanges seem to be providing a good service for institutional investors in Canada. It is possible, however, to explain this finding from a very different aspect. The results presented were all based on trades actually carried out in the market. It could be that a characteristic of Canadian institutional traders is that they are loath to take large discounts when selling
blocks or to pay premiums when buying. Because of this they carry out only those block trades where a substantial price impact is not involved. Results from monitoring actual block trades will always show small impacts because of this characteristic. Under such conditions the conclusion that the stock exchanges offer a good block trading mechanism would be ill founded.

Contrary evidence to the above line of reasoning is the lack of any widespread consensus that Canadian institutional traders are a conservative lot. One must ask "conservative relative to whom". Indications from the SEC study (see Chapter 2) are that price impacts associated with block trading on the NYSE were of a similar order of magnitude. Also the uptrend in the percentage of trading on the exchanges accounted for by block trading which is detailed in Chapter 1 indicates that there is a large amount of block trading being carried out on Canadian Exchanges (about $2 billion annually), and that this amount is increasing rapidly both absolutely and as a percentage of all trading.

With respect to the MSE/TSE Stock Exchanges' block trading rules some conclusions about the usefulness of the five day rule can be drawn from Figures 6-6 and 6-7. As pointed out in the previous chapter, the day five price impact for buys is equivalent to the commission rebate earned. This implies that block trading customers pay a premium that completely negates the discount on that portion of a
trade traded on day five. However, a study of the volume impact associated with 5 day trading implies that only marginal amounts tend to be traded after day 2 which implies: (1) that institutions utilize the five day rule to their benefit, (2) the time period may be unnecessarily long. Alternatively the results could imply that institutions should attempt to complete trades by the third rather than the fifth day.

The final conclusion with which we are left in regards to the five day rule is that it is either too long or too short. Too long as described above, but also possibly too short, for if the rule allowed trades over, say, a thirty day period there should be no market anticipation of potential buying pressures on the last days as they would be relatively far in the future. This would result in little price advance over the trading period.

In terms of market imperfections, it appears that price impacts on the day of the trade (intra day effects) tend to be too small, and the variance about the mean impact too large, for a system of buying just after block sales to be profitable. The recovery was only .09 per cent, far too small even ignoring commissions. A system of selling just after a block purchase would also lose money, as the post block intra day price movement tended to be a further price rise.
U.S. and Canadian Results Compared

In Chapter 2 of this thesis two American studies, those of Scholes and the SEC, were discussed in detail. Although there are very important methodological differences in the way blocks were classified as either buys or sells, and definitional differences as to what constitutes a block trade, a comparison of U.S. and Canadian results is informative. A note of caution must be sounded here for these three studies are not replications of one another with different data, hence any judgements as to the implications of cross study comparisons must be well qualified.

Table 7-3 shows, in summary form, the chief findings of the three tests that were common to all three studies. In essence the findings of this study closely resembles findings of the SEC/K & S study for trades classified as buys. For sells the liquidity effect reported here agrees, for the most part, with SEC/K & S but both these studies are at odds with Scholes' findings of an information effect for sales. The difference is perhaps attributable to the fact that Scholes' results are based solely on secondary distributions where liquidity costs may take the form of an underwriter's markup instead of a market price effect.

Suggestions for Further Work

Further work on large value trading on the Canadian Equity Markets could be pursued along two different fronts.
<table>
<thead>
<tr>
<th>STUDY</th>
<th>1 Intra day effects</th>
<th>2 Price impacts</th>
<th>3 Value of trade vs. impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scholes: Sales</td>
<td>.2% recovery after a .7% price drop</td>
<td>&quot;permanent&quot; effect of -2.5%</td>
<td>no relation</td>
</tr>
<tr>
<td>SEC/K &amp; S: Sales</td>
<td>.7% recovery after a 1.8% price drop</td>
<td>&quot;permanent&quot; effect of -2%</td>
<td>weak +ve relation found</td>
</tr>
<tr>
<td>Buys</td>
<td>.09% drop after a 1.5% price rise</td>
<td>&quot;permanent&quot; effect of 5.8%</td>
<td>no relation</td>
</tr>
<tr>
<td>This Study: Sales</td>
<td>.13% rise after .49% price drop</td>
<td>&quot;temporary&quot; effect of about -.5%</td>
<td>weak +ve relation found</td>
</tr>
<tr>
<td>Buys</td>
<td>.09% rise after a .32% price rise</td>
<td>&quot;permanent&quot; effect of +2%</td>
<td>no relation</td>
</tr>
</tbody>
</table>

Area one would be to examine price impacts over both a longer period of time, and at the same time over more varied market conditions. The second front would be an examination of the nature of block traded versus non block traded stocks.

Carrying out the first type of extension to this study involves replicating the study on large samples of block trades taken over various periods of time. Since the data bank used for this study was assembled there has been a marked market price recovery. Sampling of block trading
over this period with subsequent price impact calculations could lead to interesting results. It would seem relevant, for example, to find out if more recent institutional trading is associated with larger (or smaller) price impacts. The difficulty with such testing is the problem of assembling sufficiently large data bases. None of the stock exchanges' volume discount data is routinely converted into machine readable form. Hence any analysis is extremely laborious for the researcher, or at best, time consuming and expensive. Perhaps it is worth suggesting here that instead of the present monthly volume discount report (which is simply a printed form on which brokers report details of individual trades for the month and calculate various totals), an alternative system should be devised. If each trade were reported on a "mark sense" computer card by the broker a small deck of cards would replace the present report. Such a system would eliminate all typing and calculations for the brokers and allow all calculations presently done by hand at the exchanges to be automated. The pay-off for the researcher would be a ready made machine readable data base.

The second possible extension would be to examine fundamental accounting data for the individual stocks that

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1 This type of card is simply filled in various indicated places with a dark pencil. The marked card is then mechanically converted into a conventional computer punch card. Such schemes are commonly used for university exams, etc.
make up the group of stocks block traded, and compare these with similar data for stocks that are not block traded regularly. This work could lead to the development of a profile of block traded stocks. It is expected that a group of stocks would be consistently identified as block traders and that these stocks would be characterized by large outstanding market values, i.e. a large float. In addition to the above, it would be expected that a smaller number of stocks not characterized by a large float would be included, but that this group of stocks would vary considerably over time.

Summary

This chapter has dealt mainly with implications of this thesis to various interest groups. To summarize the chapter and conclude the thesis these implications are presented in point form below.

Implications for:

Institutional Investors: Small price impacts imply that Canadian institutional investors trade large values of stock with little adverse price effect. Large value trades tend to take place when volume of trading for the specific stock is high. Institutional traders tend to purchase stocks when prices are relatively high and rising. They tend to sell high institutional interest stocks when prices are relatively low and falling. Sales of low institutional interest stocks, while resulting in price declines around the day of the sale, tended to be made after significant price increases.
The Public: People indirectly involved with block trading through their participation in pension funds, life insurance, etc., are not burdened with excessively high trading costs as price effects associated with block trading are small.

Brokers and the Exchanges: The market as it exists and brokers as they are presently set-up seem to serve the needs of institutional traders reasonably well. No way of capitalizing on the price impacts associated with block trading appears feasible.

Block Trading Rules: Large impacts on day 5 for five day purchases imply that day 5 trading is expensive, but volume considerations indicate most trading is done on days 1 and 2, hence despite the high cost of day 5 trading, net economies are realized by institutions when the commission rebate is applied to the entire trade. The five day period could possibly be changed, however.

Finally, it bears pointing out again that these implications hold only for those stocks commonly block traded. Somewhat different results, hence different implications were found for stocks that are only infrequently block traded and of course no conclusions can be made about trading stocks that are never block traded.
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