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International Interlisting:
A Study of Firms Listed on the Toronto Stock Exchange
and Major U.S Stock Exchanges

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ABSTRACT

International Interlisting:
A Study of Firms Listed on the Toronto Stock Exchange
and Major U.S Stock Exchanges

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Concordia University, 1987

Firms which are listed on a national stock exchange and which have also listed on one or more foreign stock exchanges are said to be internationally interlisted. This dissertation examines the motivations behind the interlisting phenomenon and its implications for the firm and the capital market.

In is argued that firms which internationally interlist do so at a robust stage in their development such that the direct and indirect costs associated with interlisting are outweighed by the benefits to be derived from this activity. Primary evidence is provided regarding the costs and benefits related to interlisting. In addition using both descriptive statistics as well as multinomial logit analysis, the hypothesized robustness of firms during the period surrounding the interlisting event is empirically supported.

In investigating the market response to the interlisting event, it is found that conventional event studies may obscure the capital market response to the interlisting event since the assumption of invariant systematic risk is required. It is discovered that for most interlisted firms abnormal returns dissipate once specific account is taken of changes in risk surrounding the interlisting event. The changing risk profile during the period surrounding the interlisting event is also in evidence when the switching regression technique is employed.

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This dissertation is lovingly dedicated to Mohsen and Emy.

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ABSTRACT

This dissertation examines the issues surrounding the event of
international interlisting. International interlisting occurs when a
firm which is listed on one or more national stock exchanges also lists
on a foreign stock exchange. In the present research attention is
restricted to firms listed on the Toronto Stock Exchange which have
interlisted on either the American Stock Exchange or the New York Stock
Exchange. Relatively little research has to date focused upon
international interlisting and its implications for the firm, investors,
and the stock exchanges themselves. Thus although the move from the Over
The Counter (OTC) market to an organized exchange has been studied
fairly extensively as demonstrated in Chapter Two, this research fills a
gap in the literature by its detailed treatment of the cross-border
listing phenomenon. Relatedly, studies of listing events have in general
concentrated upon the market's reaction to the announcement of listing
within the context of efficiency criteria. The approach adopted in this
dissertation is consistent with the traditional methodology insofar as
the market reaction to the interlisting event is assessed. However, both
conventional event study methodology as well as intervention analysis
are used in the investigation of share price reaction when interlisting
occurs. In order to facilitate the interpretation of such market
responses, the economic underpinnings of abnormal returns are examined
prior to assessing the market response. A descriptive framework is
developed which suggests that the firm moves through three identifiable
stages in an interlisting life cycle: the pre-interlisting phase, the
currently interlisting phase, and the mature interlisted phase, during

which firm performance is expected to differ markedly. The use of this framework may lead to the conclusion that "abnormal" returns, when measured in a conventional manner, can in fact be consistent with market efficiency rather than inefficiency as is usually the case. The multinomial logistic regression model (ML) is employed to predict the probability the firm will fall within one of these stages versus the probability the firm will not be interlisted. Use of the ML model permits investigation of the economic performance of the firm at each stage of its evolutionary process and consequently permits an informed interpretation of the results to be obtained from an investigation of the market efficiency implications of the event of international interlisting. Usually, event studies take account of confounding events defined in a much narrower manner, specifically concurrent events. Thus a significant contribution made by this dissertation is the enlarging of the "confounding" event definition. The methodological approach thus holds important implications for all types of anomalous stock market behavior such as the small firm effect and the period of listing effect documented in previous research.[1]

In explaining why interlisting occurs, the structure of the North American capital market is examined with reference to the existing literature regarding the degree of integration. Possible reasons for holding that the North American capital market is at least mildly segmented are advanced. Within the context of a mildly segmented capital

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[1]See, for example, Roll (1983) and Zeghel (1984); as well as references contained therein, regarding the small firm effect. Barry and Brown (1984) provide empirical evidence which leads them to conclude that the longer a firm has been listed on an organized exchange, the less likely are abnormal returns. They argue that the period of listing is a useful proxy for the information about the firm.

market the motivation for international interlisting is hypothesized to arise out of the firm's need to fuel capital expenditure requirements outside the geographic confines of the Canadian capital market. In terms of benefits, the firm thus anticipates enhanced access to U.S. capital markets, declines in systematic risk, common share price appreciation, and improved liquidity. To realize these benefits, however, substantial costs are incurred. Emphasis is placed on legal and accounting as well as disclosure costs, rather than upon the direct dollar costs of listing which are known to be minimal. Since no record exists on these former costs, however, nor is there published evidence regarding the motivations for interlisting, a survey of interlisted firms was undertaken in order to aid in the clarification of these issues. This primary data will also represent a contribution to the existing literature which relates to the listing, and more specifically, the interlisting phenomenon.

Although no direct empirical test of the market integration hypothesis is carried out, due to the intractability of the existing methodologies to do so, switching regressions will be employed as a means of ascertaining whether or not a structural change in the regression relationship occurred during the period surrounding the interlisting event. Structural changes, such as are found, will buttress the qualitative arguments advanced which favor a mildly segmented North American capital market structure and will therefore contribute importantly to the understanding of the issues surrounding interlisting.

Finally, through conducting an event study of the stock price behavior of interlisted firms, new information is added in regard to the efficiency of the market with respect to the interlisting event. In this,

regard, intervention analysis is used in place of conventional event study methodology. The approach is potentially more robust than market model calculations of abnormal returns, since analysis is carried out on a firm by firm basis and explicit account is taken of the possibility that shifts in systematic risk may accompany international interlisting.

CHAPTER ONE
INTERNATIONAL INTERLISTING--AN INTRODUCTION

1.1 AN OVERVIEW OF INTERNATIONAL INTERLISTING

Firms which are simultaneously listed on a national stock
exchange and on one or more foreign stock exchanges are said to be
internationally interlisted. Very little is known about the consequences
of international interlisting despite the fact that in recent years the
number of firms which have interlisted has risen dramatically. By 1984
it was estimated that over nine hundred firms had interlisted on foreign
exchanges (EUROMONEY, May 1984). Equally important, the trend toward
multiple exchange listings appears to be on the upswing. In May of the
same year EUROMONEY published the first ever "Euroequities" list. In
order to qualify for the list the firm must have had an active daily
market for its securities outside its home exchange. As noted by
EUROMONEY (op.cit.), many of the firms which internationally interlist
are able to generate an initial surge of interest in their equity at the
point of interlisting only to subsequently fall to obscurity. In spite
of some "unsuccessful" interlisting efforts, there were two hundred and
thirty-six firms from nineteen countries which made the EUROMONEY list
in 1984. One year later the Euroequity list had expanded to include
three hundred and twenty-eight firms from twenty-one countries
(EUROMONEY, May 1985). The identical criterion of market activity was
applied in drawing up the 1985 list as was used in preparing the
previous year's list. Interestingly, the evidence available from year to
year comparisons suggest that a solid core of international equities is
emerging. Only twenty-eight companies on the 1984 list are absent from

the 1985 rankings. A number of TSE interlisted firms are included in the EUROMONEY rankings. They are Bell Canada, Northern Telecom, Echo Bay Mines, Canadian Pacific, Alcan Aluminum, Inco, Dome Mines, Genstar Corporation, Imperial Oil and Ranger Oil.

It should be noted that in terms of numbers, TSE stocks interlisted in the U.S. represent only, a minor fraction of all TSE stocks traded, and similarly are relatively small in number when compared to AMEX and NYSE totals. However, in terms of value of stocks traded, TSE interlisted stocks accounted for 27.4% of the total market value of AMEX stocks traded in 1983. It also appears that TSE firms interlisted on AMEX are on average, substantially larger than other companies traded on AMEX.[2]

The growth of the international equity, as well as the importance of TSE stocks in terms of value for AMEX, might in and of itself be a compelling reason for investigating the international interlisting phenomenon. To date, financial economists have not investigated to any great extent, the problems and implications of international interlisting. This may be unfortunate. Indeed, the consequences of international interlisting extend beyond those which are firm specific to encompass structural changes in the world capital market.

In certain respects the decision to internationally interlist is likely motivated by those same forces which led to the firm's initial listing on an organized national exchange. Hence the hypothesized benefits to the firm include the possibilities of price enhancement

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[2] See TSE Review and AMEX and NYSE Fact Books.

effects for their common equity, risk reassessment and improved share liquidity. In a sweeping review of the international equity market, EUROMONEY (May, 1984) concludes that for many firms these benefits are simply not realized. Nevertheless, in recent years, there have been almost startling shifts in the way in which Euroequities are perceived. Twenty years ago, a firm which interlisted on a foreign exchange was unable to maximize the benefits accruing from an international listing simply because there was no institutional framework in place to encourage continued interest in the firm once the event of interlisting itself had passed. For the firms which interlist today, there exists a broad range of brokerage and analyst services which specialize in following interlisted firms. EUROMONEY (May, 1985) in its discussion of the Euroequity list observes that although twenty-one industry groups are represented therein, the growth industry which is emerging is the brokerage business. In assessing the potential of the new Euroequity market, EUROMONEY observes:

> The growing body of information on these companies collected by brokers and their analysts has had a considerable effect on investment policies. This year's list, for instance, shows a significant switching away from the glamorous and the trendy. The emphasis has moved to consumer durables, industrial equipment and electronics. The choice is very much concentrated on the larger, better-known corporations with good track records and good growth potential.[3]

The maturation of the international equity market suggests that an analysis of interlisted firms may be best carried out by grouping interlisted firms according to their age of interlisting. In this way it may be possible to discriminate among the firms which have interlisted

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[3] EUROMONEY, May 1985, pp. 122-123.

in the past and those that are either in the process of interlisting or will do so in the future.[4]

The implications of international interlisting, however, extend beyond firm specific benefits. For the home country stock exchange, there is the possibility that interlisting can promote operational efficiency by reducing the local price of marketability services. Tinic and West (1974) analyze the marketability services provided by the Toronto Stock Exchange and compare them to those available on the New York Stock Exchange and the American Stock Exchange. The evidence from their study does not imply the existence of feedback effects which would enhance the organizational efficiency of the TSE. However, the Tinic and West study covers what might be termed the "early interlisting period." Therefore their results may not be applicable in the present situation where potentially higher calibre firms are interlisting. In addition, regulated commission rates for trades on the TSE were abolished in April 1983.

Significantly, the emergence of the international equity has carried with it an attempt by the various national exchanges to harmonize their listing requirements. This was precisely the topic of the annual meeting of the World Federation of Stock Exchanges held in Paris in the late fall of 1984.[5] Currently, the Securities and Exchange

[4]As explained in detail in Chapter Six, within a given time frame firms which will interlist in the future can be defined on an ex-poste basis.

[5]Information conveyed by the TSE's representative to this conference.

Commission (SEC) in the U.S. has put forward proposals which would lead to homogeneity in the preparation of prospectus requirements in the U.S., the U.K., and Canada.[6] Hence the rapidly changing international equity market holds the potential to promote the integration of the world capital market. The interlisted securities can provide the investor with a vehicle for international diversification while freeing him from the necessity of incurring transactions costs on foreign currency purchases and sales. Perhaps what is more significant in this regard, however, is the growing awareness that exchange risk does not play the divisive role in capital market segmentation that it was once credited with.[7] Rather, segmentation is viewed, more and more, as deriving from the different institutional arrangements of the various national stock exchanges. It may well be the case that international interlisting will serve as the catalyst for greater capital market integration through promoting the establishment of homogeneous listing requirements and rules of procedure on the various national exchanges. This issue is discussed more fully in this dissertation.

In summary, international interlisting is seen to provide both firm and market wide benefits. The event, itself, however, pre-supposes that a degree of world capital market segmentation exists. Otherwise firms would not be required to incur the expense of interlisting in order to stimulate activity by a broader range of investors. A central theme of this dissertation is that capital market segmentation has

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[6]EUROMONEY, May 1985, p. 177.

[7]For a discussion of the role of exchange risk see Adler and Dumas (1983) and Kohlhagen (1985), as well as Chapter Three in this dissertation.

served as the stimulus behind the firm's decision to internationally interlist. Moreover, due to the hypothesized segmentation of the world capital market, and the North American capital market in particular, firms which interlist may have been motivated by the need to fulfil growing capital expenditure requirements outside the geographic confines of the Canadian capital market. Furthermore the role of thin trading on the TSE which has been documented by Fowler, Rourke, and Jog (1979), should not be discounted both in its impact on the segmentation of the North American capital market and its influence on the firm's decision to internationally interlist in the hopes of improving the liquidity of the firm's shares. These issues are explored more fully in subsequent chapters of this dissertation.

1.2 SCOPE OF THE DISSERTATION

In this introduction, the objective has been one of providing the reader with an overview of the complexities surrounding the issue of international interlisting. In the chapters which follow, the focus of the dissertation will be upon Canadian firms which are listed on the TSE and which have interlisted on either the New York Stock Exchange or the American Stock Exchange. At the outset, a review of the existing literature relating to listing and interlisting is undertaken. The stage is then set for subsequent theoretical and empirical investigation by discussing the empirical literature which relates to the degree of world capital market integration. Reasons are advanced for holding the belief that the North American capital market may be at least mildly segmented in structure. From here, the benefits and costs of international interlisting are then analyzed and it is proposed that firms will

internationally interlist only at a robust stage in their development such that the costs incurred do not exceed the benefits to be derived therefrom. Thus, it is hypothesized that the "age" of the interlisted firm is a useful criterion to demarcate the patterns of performance of the interlisted firm. In this regard it is advanced that a life cycle theory of interlisting is useful as a descriptive framework within which to analyze the phenomenon of international interlisting.

1.3 ORGANIZATION OF THE DISSERTATION

This dissertation is organized as follows:

1. In Chapter Two a review of the literature relating to listing and interlisting is undertaken. A parallel is drawn between the two phenomena. It is suggested, however, that traditional event study methodology, alone, may be less useful in understanding interlisting than are alternative approaches employed in this dissertation.

2. In Chapter Three, the extent of world capital market integration is assessed via an appeal to the existing empirical literature. It is argued that the differing institutional arrangements of the various stock exchanges may serve to inhibit international capital flows in the absence of outright restrictions which do so. Possible sources of segmentation in the North American capital market are explored as well.

3. Chapter Four builds upon the conclusions which are drawn in the previous chapter. To this end a life cycle theory of interlisting is advanced.

4. In Chapter Five the results of interviews conducted with Vice-Presidents or Treasurers of recently internationally

interlisted firms are reported. Thus insight is gained into the motivations behind the firm's decision to internationally interlist, as well as the costs and benefits associated with this activity.

5. In Chapter Six the evolutionary perspective to international interlisting is evaluated using descriptive statistics as well as the more sophisticated multinomial logit model.

6. Chapter Seven deals with the market response to the international interlisting event. The conventional event study approach is adopted as well as the intervention analysis approach in examining how the market reacts to international interlisting. In addition, the technique of switching regressions permits investigation of the proposition that a shift occurs in the risk-return relationship of the firm once international interlisting is accomplished.

7. The conclusions and directions for future research are found in Chapter Eight.

CHAPTER TWO
EVIDENCE REGARDING LISTING AND INTERLISTING

2.1 INTRODUCTION

In this chapter a review of literature relating to the subjects of listing and interlisting is undertaken. It is argued in the concluding remarks that the event study methodology typically applied in the most recent investigations of this phenomenon unnecessarily constrain the analysis and, furthermore, may lead to a misrepresentation of the issues involved in understanding international interlisting.

The organization of this chapter is as follows. In Section 2.2 the literature pertaining to listing on U.S. exchanges is reviewed. The international interlisting literature is reviewed in Section 2.3. General comments on the listing and interlisting literature and its implications for the present research are found in Section 2.4.

2.2 THE LISTING LITERATURE

The value of listing on an organized stock exchange has been the subject of numerous empirical investigations. In general, research has focused upon U.S. firms which list for the first time on either AMEX or the NYSE. In promoting official listing, stock exchanges stress the benefits which can accrue to the firm. The American Stock Exchange, for example claims that: "Most companies find that listing brings them greater trading liquidity, higher visibility, a broader shareholder base and improved access to capital markets..."[8]

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[8]_American Stock Exchange Requirements and Procedures for Original Listing_, p. 11.

Research relating to the listing event has tended to adopt two broad, although not mutually exclusive, approaches. In one case, direct empirical investigation of the perceived benefits is undertaken. A somewhat different question is addressed in the other strand of research which has developed. This relates to the question of market efficiency. Is it possible for investors to earn abnormal returns as a consequence of the firm's announcement to list or with the actual event?

The early attempts at grappling with the issue of listing are typified in a series of articles by Anna Merjos which appeared in various issues of _Barrons_ during the sixties. The 1967 study, and its predecessors, were primarily aimed at determining whether or not listing on an organized exchange would increase the market value of the firm, a potential benefit implied by the various exchanges. The Merjos studies conclude that listing could be considered an event of value to the firm. The approach used in her studies involved monitoring the price behavior of firms before and after listing. Using a limited horizon of the last six months of 1966 and the first two months of 1967, Merjos compared the stock price behavior of the newly listed firm with the Dow Jones Industrial Average and found that the sample fared well against this benchmark. Since the study fails to consider the impact of confounding events and no statistical tests of significance are carried out, it is not possible to determine whether, in fact, the results uphold or refute the hypothesis that newly listed firms outperform the market.

In examining the impact of listing for a particular firm, Cannon Mills, O'Donnell (1969) concludes that the market value of the firm rose

by nine percent[9] as a result of listing on the New York Stock Exchange. The obvious difficulty with the O'Donnell study is that one cannot infer the impact of listing for other firms based on his conclusions. Cannon Mills may (or may not) have been an outlier.

Faust (1970) studies the consequences of listing on the New York Stock Exchange for a sample of one hundred and ninety-eight firms that did so during the 1960-1965 period. In the study, banks, finance companies, and a single insurance company were excluded from the analysis. Faust's results lead to a rejection of the hypothesis that listing increases market value. His approach was to use a multiple regression pooled cross-sectional time series model which specified price as a function of dividends, the growth rate of the firm, earnings variability, leverage, size and listing. In the case of the listing variable, a dummy was employed. All variables, except the listing dummy were significant. The drawback in Faust's methodology lies in the fact that listing was incorporated as an independent variable. Later studies, which will be discussed in further detail below, note that to meet the listing requirements of the stock exchange the firm has frequently improved its performance. Hence, to a certain extent there is some confusion as to the causality between price changes and listing. In any case, Faust's analysis sheds little light upon the controversy regarding the efficiency of the stock market with respect to the listing event. Van Horne (1970) investigates the impact of listing on either the NYSE or AMEX during the period 1960 to 1967. Eighty firms listing on the NYSE

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[9]John L. O'Donnell, "Case Evidence on the Value of a New York Exchange Listing," MSU Business Topics 17 (Summer 1969) : 19.

and sixty listing on AMEX make up the sample. Although the research in the Van Horne study is primarily directed at determining whether or not listing has a positive effect on firm value, the evidence which he provides also holds implications for the efficiency of the stock market in question. The price data which he gathered for each listed firm was spread over five "event" dates as follows: four months prior to registration with the Securities and Exchange Commission, two months prior to registration, the registration date, the actual listing date, and two months after the actual listing date. These data were then expressed in price index form and a test of significance was carried out to determine if changes in the market price of the listing firm were significantly different from changes in the appropriate industrial price index over the same period. In general, Van Horne demonstrates that firms which are about to list out-perform the industry average but fall below once listing has occurred. Van Horne surmises that profit taking is the culprit in this latter reversal. Nevertheless, on balance his evidence supports the hypothesis that newly listed securities, when the entire listing period (pre and post event) is considered, out-perform industry averages. When transactions costs are incorporated, however, the advantage dissipates. Thus Van Horne's results imply that the market is efficient with respect to the listing event. Since attention was focused more on this latter issue, the question of whether or not listing is beneficial to the firm in terms of a permanent increase in the market value of the firm was not adequately addressed. For instance, Van Horne's evidence appears to indicate substantial activity for the firm in the period surrounding the listing

date. What was omitted was an empirical investigation of the price behavior of the firm outside of the immediate listing period, in an attempt to establish whether or not improved liquidity or an enhanced public image, for example, generated a more permanent change in the price of the firm's shares. Similarly, the results might be subject to reinterpretation if, say, within a year or two following listing the firm altered its capital structure. In the latter case the firm may have decided to list to stop or slow a forseeable decline in the price of the firm's equity.

Goulet (1974) does view a longer listing period than the other studies previously discussed. He examines the price behavior of one hundred and thirteen firms newly listed on AMEX between 1968 and 1970. Price observations were collected for three points as follows: six months prior to listing, the day of listing and twelve months after listing. Goulet finds that only 31.9% (thirty-six companies), of firms in the sample had price increases one year after listing when compared to their pre-listing prices. Moreover, only twenty-two of these firms performed as well or exceeded the appropriate Standard and Poors Industrial Index. Such evidence would tend to refute the supposition that listing is an event of value to the firm. Goulet includes, however, the results of a survey which he conducted of executive attitudes regarding the potential benefits of listing. He relates that:

> ...many variables, in addition to price, were important in the listing decision. Most notable was the concern for sales of additional stock and for increasing the number of shares outstanding. Additionally, the survey indicated that frequently announcement of listing on the AMEX was made concurrently with a sale of stock preceding listing. Also in a number of cases,

announcements were made at the time of listing or shortly thereafter that a sale of stock was planned.[10]

The above noted opinions regarding the listing event suggest that an examination of the anticipated price enhancement effects for common stock should take account of any change in capital structure that preceded or followed the actual listing event. There is empirical support for the hypothesis that the market, at least in the U.S., reacts negatively to the announcement of new financing. (See, for example, Dann and Mikkelson (1984), or Myers and Majiluf (1984)). Contrary evidence exists for some European capital markets, however. In particular, a recent study of the Swiss capital market by Loderer and Zimmerman (1985), yield results which suggest stock price enhancement effects in the face of new financing. Thus, although the possibility of positive stock price reaction is not ruled out, no change in the price of common stock as a result of listing does not, itself, necessarily imply that the firm has squandered funds by gaining admission to an organized exchange. Goulet provides limited empirical support for this hypothesis. In two thirds of the sample, there was an increase in both shares outstanding and shares publicly held around the listing date. This according to Goulet, suggests substantial insider trading in response to the decision to list. In addition to ignoring such potential dilution effects, Goulet also fails to analyze share price liquidity in the pre and post listing period, and had such an analysis been carried out, the impact of listing on the price behavior of the firm might have

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[10]Waldemar Goulet, "Price Changes, Managerial Actions and Insider Trading at the Time of Listing," *Financial Management* 3 (Spring 1974) : 34.

been better understood. To the extent that a change in liquidity and/or price pressure originating from dilution were detected, there might have been tangential support for the argument that listing slows or stops expected price declines.

Fabozzi (1981) argues, as did the aforementioned papers, that listing potentially reduces the cost of equity financing for the firm. He cites the role of specialists on the organized U.S. exchanges that lead to a more liquid market for the firm's shares as a possible reason. He also acknowledges that listing on an organized exchange may serve to inform market participants of management's confidence in the future prospects of the firm as well as promoting the firm to institutional, marginal, and foreign investors who otherwise might not invest due to lack of information.

Fabozzi examines eighty-three firms which moved from the Over The Counter (OTC) market to AMEX during the period 1972 to 1975. Weekly stock returns are used. He adopts the market model approach to test the hypothesis that abnormal returns can be earned by following an investment strategy of buying and selling newly listed firms. Three empirical models are tested; the Sharpe market model, an empirical analogue of the CAPM, and an examination of residuals obtained by regressing the average returns of securities over the period on their estimated beta coefficient. The approach must be criticized since a joint test of hypotheses is being carried out--that the model, in this case the CAPM or variant thereof, is correctly specified and that listing enhances the market value of the firm. Brown and Warner (1980) in a review of event study methodology provide empirical evidence to

support their contention that a simple mean adjusted returns model provides as much information about abnormal returns as do the more sophisticated risk adjusted models. Although one might suggest that Fabozzi's results would have been more robust had he opted for a less sophisticated methodology, the results of empirical investigation of the three models he employs yield identical conclusions. Positive abnormal returns could be detected between the application for listing and the event itself but after listing this is offset by price declines. Thus Fabozzi's results dispute the contention that listing reduces the cost of the firm's equity. In addition, Fabozzi's results indicate that buying a share just prior to or at the announcement of the intention to list, and selling just prior to the actual listing could present a profitable trading strategy for the investor. Hence, his results imply that the market is not efficient with respect to listing information.

McConnell and Sanger (1984) produce results regarding efficiency which are congruent with those obtained by Fabozzi (op.cit.). They examine the price behavior of three hundred and nineteen firms that moved from the Over The Counter market to the NYSE during the period 1966 to 1977 and compare this to the movement of the Standard and Poors 500 Stock Index over the same period. Evidence is uncovered which supports the hypothesis that the market is inefficient in a semi-strong sense. That is, abnormal returns could be earned by buying the stock at the announcement of the intention to list, then liquidating the position and simultaneously selling it short once listing occurred. Once again, in the McConnell and Sanger study, listing appears to have only a transitory impact on the value of the firm.

McConnell and Sanger also analyze the issue of a changing risk profile due to listing. They calculate systematic risk in the pre and post listing period as well as total risk which is defined as the standard deviation of return. They conclude that listing does not have a significant impact on the risk of the firm. Taken at face value, there is no reason to believe that systematic risk should shift. However, listing could cause a shift in the market's perception of the riskiness of the firm. The empirical tests carried out by McConnell and Sanger assume that the pricing mechanism for risk is identical in the pre and post listing period. To the extent that this is not the case, their results regarding the relationship between risk and listing must be interpreted with care. This methodological problem is undoubtedly exacerbated when the impact of international interlisting on the risk profile of the firm is considered. In these circumstances listing may have dramatically altered the underlying pricing mechanism for the firm's equity in moving from a national to an international pricing model.

A recent study by Sanger and McConnell (1986) investigates the market response of firms which move from the OTC market to the NYSE during the period 1966 to 1977. Once again, evidence is provided to the effect that prior to listing on a major exchange firms perform extremely well. Indeed, a study of the distribution of security returns reveals that it is skewed and leptokurtotic relative to the normal distribution. Sanger and McConnell divide their sample into two parts consisting of firms which moved from the OTC to the NYSE prior to NASDAQ, and those that switched to the major exchange after NASDAQ was instituted. They

hypothesize that the additional liquidity afforded by NASDAQ may have reduced the potential for abnormal returns in the post NASDAQ period. This is supported by empirical evidence. Nevertheless, although the magnitude of abnormal returns in the post NASDAQ period is smaller than in the pre-NASDAQ period, in both cases they find positive abnormal returns prior to the announcement of formal application until the actual listing, after which abnormal returns are negative and significant. The authors speculate that the existence of abnormal returns prior to the announcement of formal application may be attributable to either insider trading, the observation that firms list only during periods in which their performance is exceptional, or to the possibility that the model used to detect abnormal returns is mis-specified. Further on in this dissertation, reasons are advanced which would suggest that abnormal returns are consistent with market efficiency. Especially pertinent to the results obtained by Sanger and McConnell (op.cit.) is the possibility that systematic risk changes coincident with international interlisting. Hence, it may be the case that the model which they employed was in fact mis-specified.

The studies reviewed thus far, with the exception of Merjos (1967) are unable to detect the presence of a permanent price enhancement effect for firms which list on an organized exchange. In contrast, the empirical results obtained by Ying, Lewellen, Schlarbaum, and Lease (1977), hereafter (YLSL), lead them to conclude that the move to an organized exchange promotes the establishment of a fair market value for the firm's equity. Their sample covers two hundred and forty eight firms that listed on either AMEX or the NYSE during the years 1966

through 1968. They examine cumulative average residuals of interlisted firms, obtained from market model regressions. Hence, the criticisms levelled at Fabozzi (1981) as regards his use of the market model approach to the detection of abnormal returns are also relevant for the YLSL study. Notwithstanding this similarity, the evidence obtained by YLSL contrasts markedly with that of earlier studies. Their results show a profitable trading strategy could be implemented by purchasing newly listed stocks at the announcement date of the intention to list. However, unlike several of the preceding studies, the market correction after actual listing is not sufficient to overshadow the earlier price increases. Thus, according to the YLSL evidence, listing on an organized exchange reduces the firm's cost of capital. The authors note that a bias in their results could have been introduced if systematic risk had shifted in the pre and post listing period. They investigate this hypothesis and find no significant difference in risk between the two periods. As noted with McConnell and Sanger's (1984) analysis of the same issue, the YLSL conclusions are only valid under the condition that the pricing mechanism for the pre and post listing period remains unaltered.

Some support for the YLSL results can be found in a later study by Lease and Lewellen (1982). The latter research addresses the relationship between stock exchange location and the value of a firm's common equity. Lease and Lewellen examine the realized returns of a sample of investors who traded in the full spectrum of U.S. exchanges--the NYSE, AMEX, OTC, and regional exchanges. Investors in this sample earned significantly higher returns on exchanges other

than the NYSE, suggesting that a listing on the NYSE is consistent with the establishment of a fairer market price for the firm. Offsetting this result, however, is the fact that firms trading off the NYSE may be distinctly different in terms of size, profitability and risk than their NYSE counterparts. The listing requirements of the NYSE may not have been met by firms in the regional exchanges, for example. A more just test would have been to compare the NYSE investments with investments on the other exchanges in firms that could meet NYSE listing regulations. An attempt is made to adjust for risk but as was discussed previously in this chapter, the process is not straightforward and produces results of dubious worth.

Reints and Vandenberg (1975) directly address the issue of the relationship between listing and risk. Thirty-two companies which listed on the NYSE between May 1, 1968 and August 31, 1968 are included in the sample. The CAPM is used to calculate the systematic risk for these firms in the pre and post listing period. As in later studies by YLSL (op.cit.) and McConnell and Sanger (op.cit.) no significant difference in risk is detected. Of course, the results presume that the model is correctly specified in both periods and as argued earlier, there is no way to separate the joint hypotheses tested by Reints and Vandenberg.

Dubofsky and Groth (1984) review the problem of stock exchange listing and liquidity. They examine the impact on liquidity (assumed to be attributable to listing) during the 1975-1981 period, for one hundred and twelve firms that moved from the OTC to AMEX, one hundred and twenty-eight firms going from the OTC to the NYSE, and one hundred and

four firms that switched their listing from AMEX to the NYSE. Two liquidity measures are employed, the Amivest Liquidity Ratio (ALR) and the Martin Index (MI). The ALR measures the average dollar volume of trading (in thousands of dollars) per percent of price change, while the MI measures the ratio of the square of the price change between trades, to the volume of trading on the latest day.[11] Both the ALR and the MI evidence show a significant decline in liquidity when moving from the OTC to either of the organized exchanges. In contrast, firms moving from AMEX to the NYSE show an initial improvement in liquidity before declining to values just above those of the pre-listing period.

The Dubofsky-Groth results lend support to the prior empirical evidence cited in this chapter regarding the price enhancement effects of listing, albeit transient as regards the results in their study. While the majority of researchers found that no permanent price enhancement could be detected, Lease and Lewellen (op.cit.) were able to show that fairer prices are established on the NYSE as opposed to the more junior exchanges. Insofar as international interlisting involves the move from one organized exchange to another, in contrast to a move from the OTC to an organized exchange, the Dubofsky and Groth results may hold implications for the present research.[12] Listing is considered to enhance the value of the firm by causing an upward evaluation of its share prices, although various studies call into question the permanence of this price improvement. Increased liquidity and reduced systematic

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[11]D. Dubofsky and J. Groth, "Exchange Listing and Stock Liquidity," The Journal of Financial Research, 7 (Winter 1984) 293.

[12]The liquidity of interlisted firms will be examined in this dissertation.

risk are also considered to be potential benefits derived from listing on an organized exchange. Several studies including Van Horne (1970), Furst (1970), Fabozzi (1981) and McConnell and Sanger (1984), find that positive abnormal returns prior to the listing date are offset by price declines which follow the event. In contrast, the empirical results obtained by Ying, Lewellen, Schlarbaum and Lease (1977), do not find that the reduction in return after the listing date absorbs the gains made prior to that time. Collaborating evidence is supplied in a later study by Lease and Lewellen (1982).

The event of listing itself, should not generate changes in a firm's risk profile. However, insofar as risk has been overestimated on a junior exchange there is reason to believe that listing on a more senior exchange will coincide with perceived risk reduction. Once again, the empirical evidence to date is mixed regarding this question. Van Horne (1970) finds AMEX firms are riskier than their NYSE counterparts. This finding, however, is not supported by Reints and Vandenberg (1975), YLSL (1977), or more recently, McConnell and Sanger (1984).

Finally, in regard to the liquidity question, Dubofsky and Groth (1984) provide evidence to the effect that the liquidity of a firm's common stock declines when the move is made from the Over The Counter market to an organized exchange, but that switching from AMEX to the NYSE has no lasting impact on share liquidity. Tangential evidence regarding liquidity is also provided by Sanger and McConnell (1986) wherein it is found that abnormal returns in the post-NASDAQ period are smaller in magnitude than those in the pre-NASDAQ period, for firms

moving from the OTC to the NYSE. The authors conjecture that this result may be attributable to enhanced liquidity on the OTC in the post-NASDAQ period which serves to diminish somewhat, the advantages provided by an NYSE listing.

To summarize, the study of the initial listing phenomenon has been unable, to date, to produce unequivocal evidence in support of the perceived benefits of listing. The research previously cited has for the most part, analyzed the listing issue within the framework of event study methodology. One of the difficulties which is repeatedly encountered in these studies is the use of market models to explain observed behavior. Hence the results are always biased by the inherent test of a joint hypothesis. Furthermore, implicit in the work to date has been the assumption that only two classes of firms exist--those which list on an organized exchange or move from a junior to a more senior one; and those that are already listed on the exchange. Several studies, including those conducted by Furst (1970), Reints and Vandenberg (1975), and McConnell and Sanger (1984 and 1986) recognize that listing is associated with a prior general improvement in a firm's performance. Thus it is suggested that price enhancement effects when evidenced are simply the result of a correct upward evaluation of the firm by market participants. No study, to date, however, has examined how lasting is this improved performance.

2.3 REVIEW OF THE INTERLISTING LITERATURE

The subject of international interlisting is one which has been largely ignored by financial economists. The presumed advantages of

enhanced price and liquidity as well as perceived risk reduction that apply to listing may well hold true for the firm which internationally interlists. As discussed in Chapter One, in the majority of cases these benefits do not appear to have been realized. Furthermore, international interlisting may aid in the integration of the world capital market and in so doing not only enlarge the investor's opportunity set but also improve the operational efficiency of smaller exchanges outside the U.S. Indeed, when attempting to attract foreign companies the London Stock Exchange, for example, makes no mention of the "traditional" arguments for listing. Rather, what is stressed is the publicity which a listing affords, the potential for developing business contacts, the ease with which the Eurobond market may be accessed, and a widening of the base of potential investors.[13]

In terms of enhancing the operational efficiency of the home exchange, evidence obtained by Tinic and West (1974) tends to refute the hypothesis. They analyze the marketability services provided by the Toronto Stock Exchange and the American Stock Exchange. Although not directly addressing the role played by interlisted firms, they find the Canadian market to be less efficient. Thus, the existence of a feed-back mechanism generated by interlisted firms would seem to be ruled out. On the other hand, since the period covered by the study represents a time when interlisted firms did not receive a strong following by analysts specializing in foreign firms, as is the case presently, it is not clear if the results would hold up in the emerging international equity

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[13]London Listings for Overseas Companies, Barclays Merchant Bank Limited (1981) : 3.

market. Indeed, evidence given in Chapter Four of this dissertation regarding the decline of transactions costs on the Toronto Stock Exchange would seem to suggest that interlisted firms may have a role in reducing overall transactions costs on the home exchange, although factors other than interlisting have undoubtedly played a part as well.

Booth and Johnson (1984) investigate the ex-dividend day behavior of firms listed on the TSE during four sub-periods that cover the years 1970 to 1980. In attempting to determine how the Canadian market values dividend paying stock one of the tests which is performed involves dividing the sample into interlisted and non-interlisted firms. It is interesting to note that the behavior of interlisted firms suggest an "American clientele effect" in contrast to the preference for capital gains exhibited by the "Canadian clientele" which is evidenced for the overall sample. For Booth and Johnson this result is indicative of the fact that interlisted firms are priced in the U.S. and not in Canada. If such a situation prevails it could have important effects for the structure of the Canadian capital market. In particular a tiered stock market could result with interlisted firms comprising one such tier.

The only direct evidence on the interlisting phenomenon is provided by Switzer (1985). He divides the sample of TSE firms used in the study into two groups, those which are interlisted and those which are not. Using a logistic regression approach he is able to demonstrate that the probability of a TSE firm interlisting on the NYSE or AMEX is positively associated with high dividends per dollar of sales.

The size of the firm, as measured by assets, is also found by Switzer to be positively related to the probability of interlisting. This result is to be expected given that the U.S. exchanges examined require a higher threshold size for admittance to the exchange than does the TSE. Profits, on the other hand, are negatively related to the likelihood of being interlisted. At first this result seems counter-intuitive. It also contradicts the observations made in the listing literature that firms exhibit exceptionally good performance just prior to listing. What should be pointed out in the Switzer study, however, is the fact that a cross-section of interlisted firms in 1981 was used in the sample. The author acknowledges that the negative coefficient is possibly explained by the fact that many of the interlisted firms included in the sample had interlisted many years ago. Thus, he hypothesizes that the "age" of the interlisted firm may be an important factor contributing to the observed inverse relationship. His explanation conforms to the arguments put forth by EUROMONEY (May 1984 and May 1985), and discussed in Chapter One, that the nature of the international equity market has changed significantly in recent years. In a later study, Switzer (1986) examines the market response to the interlisting event using a conventional event study approach that assesses residuals based on the mean adjusted returns model. He finds evidence of abnormal returns when TSE based firms interlist in the U.S., and also observes that just prior to the interlisting date and following the event, the cumulative average residuals become persistently positive. One of the central arguments of this thesis, however, is that the Switzer results may be entirely compatible with market efficiency since the abnormal returns which were

detected may be reflecting both heightened risk and actual improved economic performance of the firm during the interlisting period.

One additional unpublished study addresses changes in stock liquidity that may occur coincident with international interlisting. Taylor (1986) finds that following interlisting, significant increases in liquidity occur for TSE based firms that interlist on either AMEX or the NYSE.

The review of the interlisting literature points out, if nothing else, that there is a paucity of information relating to the consequences of this phenomenon. There does not appear to be a role for interlisted firms in enhancing the operational efficiency of the TSE as evidenced by Tinic and West (1972). However, the results obtained by Booth and Johnson (1984) and Switzer (1985) imply that securities which are interlisted are priced in the U.S. rather than Canada.

2.4 IMPLICATIONS FOR FUTURE RESEARCH

In general, the evidence is mixed regarding the advantages associated with either listing or interlisting. Several important points need to be re-emphasized, however. For one, the listing literature shows a potentially more favorable effect for listing when the move is made from one organized exchange to another, as opposed to a move from the Over the Counter market to an organized exchange. Secondly, several authors stressed the public relations aspect of listing, and in the case of interlisting this was seen as precisely the element highlighted by the exchange, itself, in attempting to attract new foreign listings. Finally, there is some evidence to indicate

that the underlying pricing mechanism of internationally interlisted firms differs from that of exclusively nationally listed firms.

Despite these three caveats, there is an absence of a theoretical framework within which the listing or interlisting phenomenon can be analyzed. One is left with the somewhat disturbing impression that the move to an organized exchange, be it intra-country or inter-country, is not terribly advantageous for the firm. In part, these conclusions are the result of the event study methodology which has been employed in a number of cases to study the problem. This methodology focuses upon a very short period surrounding the listing event and regardless of the technology used to detect abnormal returns, implicitly only two groups of firms are considered--the newly listed firms and firms which are entrenched on the organized exchanges. This dichotomous characterization of the problem may be particularly damaging in the study of interlisted firms where the rudimentary evidence to date suggests that the "age" of the interlisted firms may play an important role in determining the behavior of the firm and the nature of the equity market. Of equal importance in the event study approach is the fact that confounding events may have been ignored.[14] Goulet (1974) noted that newly listed firms frequently alter their capital structure at some point surrounding the listing event. Hence the price profile of the firm before and after listing may reflect such changes to the extent that the firm's systematic risk remains unchanged by the event of interlisting. To detect the consequences of a change in capital structure a period longer

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[14] For a review of event study methodology see Brown and Warner (1980) and (1985).

than the typically used eight to twelve weeks surrounding the event
should be examined.

Finally, as regards international interlisting, there is as yet
no clear understanding of why firms select this option. By shedding
light on the motivating forces behind the decision to internationally
interlist, a great deal may be learned about its consequences.

In summary, it is argued that the traditional event study
methodology which has been used to analyze the listing event may fail to
detect important regularities in the behavior of interlisted firms since
the "age" of the interlisted firm appears to be an important criterion
in characterizing such firms. In addition, it is argued that the
stimulus to international interlisting needs to be better understood in
order to make inferences about its consequences. In chapters Three and
Four it is precisely these areas which are explored.

CHAPTER THREE
THE MOTIVATION FOR INTERNATIONAL INTERLISTING:
THE SEGMENTED MARKET HYPOTHESIS

3.1 INTRODUCTION

The present chapter and the one which follows are devoted to an exploration of the rationale behind a firm's decision to internationally interlist. Although firms may choose to internationally interlist for a variety of reasons, the decision is essentially financial in nature and derives from the at least mildly segmented character of the North American capital market. An analysis of the firm's motivations to adopt an international listing posture may aid in identifying the benefits to be obtained through such action. In principle, international interlisting may permit the firm to fuel its ever increasing capital expenditure requirements by access to both the equity and debt markets of the U.S. By doing so, it is anticipated that the firm may lower its cost of capital simply by tapping richer markets and thus eliminating the imposed capital rationing of the smaller Canadian market. Furthermore, to the extent that the U.S. market is deeper than that of Canada, enhanced share liquidity is anticipated as a consequence of international interlisting. Improvements in liquidity, such as occur, produce two consequences of significance. Firstly, the cost of equity financing should fall since investors can reduce their liquidity premium demands. Secondly, at a functional level, increases in liquidity will produce an attenuation of the thin trading bias in estimating the risk/return profile of the firm. International interlisting may potentially provide market wide benefits as well, since interlisted firms may serve as the vehicle for capital market

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integration. Therefore, as a result of interlisting, Canadian firms which are listed in the U.S. may have their prices determined internationally rather than nationally which possibly may be reflected in the dividend policy of the firm. Finally, the operational efficiency of the Canadian equity market may be affected by interlisting to the extent that a feed back mechanism may be operative that potentially would reduce transactions costs on the TSE, at least for interlisted firms. Each of these potential benefits are now examined in turn.

3.2 EVIDENCE ON THE DEGREE OF CAPITAL MARKET INTEGRATION

In a perfectly integrated capital market there will not exist barriers which inhibit capital flows between geographically distinct markets. Thus the law of one price will hold which implies that assets with the same level of systematic risk will yield identical expected returns. The forces of segmentation take a variety of forms, of which outright restrictions on capital flows are but one. Deviations from purchasing power parity (PPP) are thought to lead to segmentation when produced by stochastic changes in the exchange rate. Such deviations may arise from permanent or occasional government intervention in the exchange or money market to support the domestic currency. Differences in consumer tastes further promote deviations from PPP. In this regard, Benninga and Protopapadakis (1985) find that when trade takes time systematic deviations from PPP are the rule rather than the exception. Conversely, in the long run, PPP is found to work well as a model of exchange rate behavior. Klein, Fardoust, and Filatov (1981) provide empirical evidence to this effect although both short-run and cyclical

deviations in the relationship are acknowledged. Nevertheless, for the international investor, short-run deviations from PPP may therefore represent a real additional source of risk, thereby segmenting capital markets to a certain extent. National fiscal policy, particularly in regard to taxation, is frequently cited as a cause of capital market segmentation. Varying degrees of political risk may be significant, particularly when the markets of developing countries are considered.[15] Indeed the very rules governing national stock exchanges can produce segmentation via reducing informational efficiency. In the matter of the Canadian versus U.S. markets, it is possible that the more liberal disclosure laws that are applied to TSE firms may make many U.S. investors reluctant to purchase shares in these firms. Although viewed in this context disclosure is beneficial to the firm and firms would not have to interlist in order to disclose, it appears that voluntary disclosure is the exception rather than the rule. While, inarguably, one can always point to one or another institutional arrangement or environmental characteristic that will promote market segmentation, the extent of segmentation remains an unresolved question.

Verification of the integration/segmentation hypothesis may ultimately not be achieved by its direct empirical investigation but rather by observing firm behavior in a less than perfectly integrated world. Indeed, attempts to ascertain whether there is a single or multiplicity of capital markets have met with very little success, chiefly due to the methodological difficulties inherent in prior direct

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[15]See Stultz (1985) and Adler and Dumas (1983) for a discussion of the causes of market segmentation. The implications of deviations from PPP are also elaborated upon therein.

tests of this hypothesis. There have been principally two approaches to testing the integration/segmentation hypothesis. The simplest approach is typically one of analyzing the correlation coefficients between national market factors. A variation on this method, which has been used less frequently, involves the use of factor analysis of the national stock market returns in order to ascertain if identical structures apply.[16] Correlation studies have been carried out by Grubel and Fadner (1971), Agmon (1972), Panton, Lessig, and Joy (1976), Rugman (1979), and most recently, Ibbotson, Carr, and Robinson (1982 and 1985).

The Grubel-Fadner (1971) study covers only three countries, the U.S., the U.K., and West Germany. During the 1965-1967 period increased inter-country correlations between national industry factors are discovered as the holding period lengthens. This general result leads them to speculate that correlation between factors is an increasing function of the share of the industry's domestic consumption which is either imported or exported. They also provide empirical evidence which shows that inter-country correlations among industries rise as the proportion of international trade to output increases. Although Grubel and Fadner do not examine the inter-relatedness of the Canada U.S. equity markets, the substantive dependence by the Canadian economy upon the U.S. as a commercial outlet would suggest high correlation between the Canadian and U.S. equity markets. Agmon (1972) attempts to directly analyze the hypothesis that the world capital market is perfectly integrated. The single market hypothesis as formulated by

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[16]See, for example, Lessard (1975).

Agmon requires that all potential gains from international as well as domestic diversification be reflected in the current prices of capital assets traded on world markets. Specifically, he tests whether or not the British, American, German, and Japanese markets comprise a single multinational equity-market. The study uses price relatives of market indices for those countries for the periods 1955 to 1961 and 1961 to 1966. Agmon finds that the movement of the German and U.S. prices are most closely related; while the Japanese and British co-movements with the American index are less related but they display roughly the same extent of co-movement. He concludes that Japan and the U.K. may represent a special subset of the four country market which in turn is weakly related to a common but unspecified, world market factor. Hence, although arguing for a degree of integration, Agmon suggests that certain countries may be intrinsically high risk.

In the opening paragraphs of this section, the definition of integration was carefully put forth. In Kohlhagen's (op.cit.) view, Agmon's assertion of what is essentially risk specialization by certain countries, could be interpreted as indicative of segmentation.

Panton, Lessig, and Joy (1976) employ weekly stock market returns for twelve countries during the 1963-1972 period. They use cluster analysis in order to ascertain the similarity of the relationship among the national markets comprising the world equity market. The authors find a core of relatively homogeneous markets--the U.S., Canada, Netherlands, Switzerland, West Germany and Belgium. The Austrian and Italian security markets seem to be the least similar to other countries. Regarding stability, it appears that in the short

run of greater than one year but less than five years, the co-movement of security returns is fairly stationary. However, for longer periods there seems to be a trend toward less structural cohesion. This evidence is somewhat puzzling. Exchange risk is frequently considered as a source of segmentation due to deviations from purchasing power parity, yet empirical evidence bearing upon the PPP theory uphold it in the long run, although short run deviations are found to exist. (See Adler and Dumas (1983) for a review.) Thus one might have expected exactly the opposite results as regards stability in the Panton, Lessig, and Joy study. Possibly exchange risk has been overrated as a disturbing element in the integration process.[17] In fairness, however, it should be pointed out that the Panton, Lessig, and Joy study comprises a period of generally fixed exchange rates world wide and therefore infrequent realignments of parities may be at the root of the observed long term instability.

Rugman (1979) compares the degree of homogeneity among economic indices for ten countries during the period 1954 to 1973. He reports high correlations between interest rates in various countries which he concludes is evidence for a nearly perfectly integrated market. Although he finds that all national equity markets are positively correlated, the degree of correlation is much less than that observed among countries when interest rate indicators are investigated. This leads him to

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[17]A recent study by Lessard (1985) supports this view. Since hedging exchange risk is usually possible, Lessard concludes that any remaining risk is likely inconsequential in taking international diversification decisions.

conclude that debt markets are more highly integrated than are equity markets.

One of the most recent studies of the correlation among national equity markets is found in Ibbotson, Carr, and Robinson (1985). Their study comprises nineteen national markets and an assortment of "other" markets for the period 1960 to 1980. They identify three relatively cohesive blocks which include the European markets, the Asian markets, and the "English-speaking block" of the U.S., Canada, Australia, and the U.K.

Lessard (1975) takes the correlation analysis methodology one step further by using factor analytic techniques to determine if the world capital market is integrated. The methodology he employs in examining one hundred and ten common stock quarterly returns for Latin American countries during the 1958-1968 period is that of principal component analysis. By dividing the sample into three sub-periods he is able to demonstrate that the proportion of the total variance explained by the first component of the returns for each of the four countries in each of three sub-periods is substantial. He finds significant correlation among the national factors but is unable to observe a stable pattern over time for the relationships. An analysis of the covariance matrix of all one hundred and ten stocks bears out the conclusion drawn from the factor analysis that returns are a function of national market factors which are themselves independent of one another. Hence, Lessard's study lends support to the contention that the world capital market is segmented. In the majority of studies cited previously, only partial results have been reported. Many of the authors included

estimations of national systematic risk using market model approaches and such results will be discussed subsequently. The intention of reporting only the correlation analysis component of each study was to highlight the diverse conclusions drawn therefrom. From the simple co-movement studies to their more sophisticated extensions--cluster and factor analyses, there was no unequivocal support for either of the alternative hypotheses regarding market structure. In addition, the correlation approach has an inherent methodological difficulty which is explained next.

In general, with the exceptions of Lessard (1975) and Grubel and Fadner (1971), the correlation studies employed monthly returns on national market factors. National market factors may have already incorporated a large amount of the diversification potential present and thus it is unclear exactly how the results can be interpreted.[18] Additional condemnation of this approach is found in Adler and Dumas (1983). They argue that small correlations between national stock market indices can be consistent with perfect capital market integration. That is, purely national shocks may produce low correlations among national stock indices while not posing barriers to international capital flows. Thus, in essence, analysis of inter-country equity market correlations provide only inadequate tests of the single capital market proposition, regardless of the magnitude of such correlations and it would appear unfruitful to further pursue such a methodology.

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[18]Using national market factors presupposes that the weights applied to individual securities will be invariant under international diversification.

A second approach to empirically examining the integration of capital markets evolves from Markowitz-type analyses. Such an approach may involve examining whether foreign and domestic assets lie on the Markowitz efficient frontier; alternatively, market model estimates and tests of national versus international pricing structures may be employed. The essence of the majority of studies of this genre is the determination of whether or not systematic risk is priced nationally or internationally. At the outset, this approach can be criticized from the perspective that a joint hypothesis is being tested, that the model is correctly specified and that the world capital market is integrated. More generally, Roll's (1977) critique of empirical studies of the CAPM apply with equal force in the international arena.

Levy and Sarnat (1970) were among the first to use a Markowitz based approach to investigate the issue of capital market integration. During the 1951-1967 period annual rates of return for the common stock indices of twenty-eight countries were computed after having been converted to U.S. dollars at the appropriate exchange rate. The mean rate of return and its standard deviation were then calculated and these values used to determine the efficient frontier of international portfolios. Their search, which was essentially directed at finding the Sharpe/Lintner market portfolio, required hypothesizing various riskless rates and then setting the appropriate market opportunity line. Although theoretically the ex-ante market portfolio should include all countries' stocks, they note that the absence of this phenomenon ex-post indicates that barriers to capital flows must have a substantial impact upon security returns, hence limiting diversification potential in an

international setting. Their conclusion offers tenuous support for the
segmented market hypothesis.

The appropriateness of the Levy and Sarnat approach is highly
questionable. Any portfolio can be ex-post efficient although nothing
is implied about the true market portfolio or its ex-ante efficiency
from such a finding. Secondly, the use of common stock indices to
determine average rates of return raises several issues. The portfolios
used may have already taken into account substantial diversification
effects even in an international framework, especially if the particular
index in question includes a high proportion of multinational stocks.
Hence, although the authors find benefits from diversification, at best
they are dealing with non-systematic risk as captured by the standard
deviation of returns.

Biger (1979) updates the Levy and Sarnat study to account for
periods when a floating exchange rate scheme prevailed. In a majority
of cases the standard deviation of the return on a country's stock
market index is magnified by exchange rate fluctuations. He constructs
the efficient set facing investors in six different countries and finds
an overall similarity among them. He attributes the discrepancy between
his results and those obtained by Levy and Sarnat (op. cit.) to the
different exchange rate regimes in force for the periods considered in
the two studies.

It was previously pointed out that the Agmon (1972) study
suggests that different countries have different risk. Agmon directly
tests this supposition through empirical analysis employing a market
model approach. He finds no significant difference in risk and thus

argues in favor of a reasonably integrated capital market structure. The methodology used is sharply criticized by Adler and Horesh (1974). They believe that Agmon's model is misspecified and could as easily accommodate the segmented market hypothesis. They argue that first of all, the use of the Fisher index as a world market proxy is inappropriate and that Agmon should have used an index of value weighted national market factors in its place. Secondly, Adler and Horesh point out that the model specification used by Agmon[19] is consistent with any capital market structure that one might wish to assume.

In their rebuttal to Agmon's work, Adler and Horesh propose an alternative form of the international market model. They suggest both the use of a value weighted world market index and the use of two stage regressions, where in the first step portfolios are formed on the basis of their ranking in Beta and then this Beta, now a measure of average risk, is used as the independent variable. The latter is the well known grouping technique of Black, Jensen, and Scholes (1972) which is used to eliminate selection bias. This procedure is particularly crucial in an international framework if Agmon's assertion holds that countries specialize in Beta. While some of the issues raised in opposition to Agmon's methodology are overcome, Adler and Horesh fail to circumvent

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[19]A two stage least squares estimation of the market model was employed. In the first stage Beta is estimated, once using the U.S. national market factor and once using the foreign market factor. A second set of regressions are performed using the Beta's obtained in the first pass as independent variables. The coefficients on Beta were not found to be statistically different.

the problems inherent in using the CAPM in an empirical framework.[20] The empirical evidence they provide leads them to reject the hypothesis that the world capital market is integrated. In defending the segmented market hypothesis, the authors suggest that the absence of perfect foreign exchange markets which force investors to bear the risk of exchange rate fluctuations, will produce a result consistent with Levy and Sarnat (op.cit.) in the sense that no single market portfolio will exist which will be held by investors everywhere. They conclude that perfect foreign exchange markets with continuous trading will again not ensure the existence of the world market portfolio since heterogeneous expectations and consumption patterns may produce different efficient sets for investors of different countries. The reasoning of Adler and Horesh is consonant with the Grubel and Fadner, and Levy and Sarnat studies noted here earlier and moreover casts doubt on the validity of the hypothesized model, and conclusions drawn therefrom, of Agmon's model.

McDonald (1973) examines the performance of French mutual funds versus a portfolio of American securities, within the context of the CAPM. He uses monthly returns for the period 1964 to 1969. The model rests on a segmented market assumption which is justified by demonstrating that during the period considered, the French and American market indices revealed only slight correlation. His analysis further corroborates this hypothesis since he finds that American securities out perform French securities for a given level of risk, as measured by the

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[20]These problems have been discussed in earlier criticisms of the market model approach in this chapter and therefore are not repeated here.

standard deviation of return. However, the French mutual funds consistently provide higher returns when compared to a national portfolio designed using a naive investor strategy. The latter is attributed to the management skill presumably embodied in the bank administered mutual funds. The results of the McDonald study are again coloured by the usual problems associated with the market model approach.

Lessard (1974) tests a multi-factor specification of the international market model, where the first factor is a proxy for the return on the world market portfolio and the second a purely national factor. By his own admission the results bearing upon the extent of market integration are mixed. International systematic risk is significant but purely national market factors are also given an important role in the pricing of assets. Agmon and Lessard, (1977) provide supporting evidence. Their results further indicate that as national systematic risk rises, international systematic risk tends to fall. Stehle (1977) arrives at a similar conclusion regarding the relationship between national and international systematic risk.

Solnik (1974b) provides empirical evidence which supports the international pricing of risk. In testing competing asset models (national versus international), he is able to show that national systematic risk is probably not a reliable indicator of the true systematic risk of the firm.

Wallingford (1974) criticizes Solnik's methodology on several counts arguing that Solnik's evidence is consistent with a variety of specifications. He points out that even if capital flows are inhibited

between countries, as long as the countries in question have some degree of openness in their economies, then stochastic dependence among the market indices of different countries may be expected. Wallingford's last point is of note. Economies with substantial trade flows will exhibit a correlation of underlying economic factors, notably inflation, even in the absence of capital flows.

3.3 CONCLUSIONS AND IMPLICATIONS FOR INTERNATIONAL INTERLISTING

Evidence bearing upon the structure of the world capital market has failed to provide sufficient and unequivocal support for either of the competing hypotheses. In essence, in both the correlation studies and those adopting the market model approach, the tests devised have been powerless to discriminate between a single or a multiplicity of markets. It appears that Black's (1974) view that market structure should be inferred from analyzing the impact of specific imperfections will ultimately prove to be the most fruitful direction in which to pursue the issue of segmentation versus integration. Kohlhagen (1985) concludes that previous tests directed at establishing market structure have been successful only in illustrating the ex-post relationship among the various equity market indices. From these results nothing can be inferred about ex-ante investor behavior, nor about the fundamental question of market integration. However, Kohlhagen asserts that the rapid and persistent expansion of the Eurobond market appears to have been coincident with world financial market integration. It is tempting to extrapolate therefrom, that international interlisting of firms will produce a similar result for world equity markets. Despite

the failure to document the structure of the world capital market, convincing arguments can be made for the fact that the North American capital market may be, at least to a certain extent, mildly segmented. It does not appear useful to pursue a research direction aimed at a direct investigation of the hypothesis due to the inherent methodological difficulties of such an undertaking. What does appear promising, however, is a more qualitative comparison of the two markets in the hope of identifying not only various characteristics that may serve to segment the world capital market, but also those structural changes in the international equity market that have produced its heightened integration. It is the task of these concluding pages to firstly discuss the evolution of the world capital market toward a greater degree of integration and secondly to explore possible reasons for holding the belief that, to an extent, segmentation of the North American capital market persists.

3.4 THE EVOLUTION OF THE INTERNATIONAL EQUITY MARKET AND THE MOVE TOWARD GREATER INTEGRATION

In Chapter One, the rising phenomenon of international interlisting was emphasized. It is useful to recall that of the nine hundred odd firms estimated to have internationally interlisted, less than a third of these could be considered as having active daily markets outside their home exchange. It was suggested that some of these "unsuccessful" interlisting efforts could be linked to the absence of a market infrastructure which would enable the interlisted firm to reap the benefits which potentially arise from listing on multiple exchanges. In the following sections, a discussion of the changing environment

surrounding the international equity market is undertaken. It is argued that a combination of forces ranging from the removal of outright restrictions on capital flows to an attempt at harmonizing the various stock exchange's rules of procedure have produced greater world capital market integration. By implication, the role of the interlisted firm in aiding this process cannot go unnoticed.

3.4.1 FINANCIAL MARKET EVOLUTION

Fixed exchange rates prevailed until 1973 for most western countries which meant exchange risk was probably greater than it is today. During the fixed rate regime, realignments of parity came less frequently than with floating rates, but were potentially more severe. Since there is no reason to believe that an international investor incurs less exchange risk by trading in interlisted firms as opposed to firms listed strictly on foreign exchanges, the switch to a floating exchange rate system likely heightened the attractiveness of internationally interlisted firms as well as off-shore investments of a more traditional nature. Thus there appears not to be a role for exchange risk in analyzing the reasons why a firm may choose to interlist. Rather alternative reasons need to be considered.

In spite of greater flexibility in exchange rate policy, it was not until the years following 1973 that more meaningful changes in exchange rate policy occurred. Until that time, a plethora of regulations governing foreign exchange transactions existed. In 1963, to cope with a burgeoning balance of payments deficit, the U.S. imposed

the Interest Equalization Tax which effectively constrained foreign portfolio investment. It was subsequently removed in January 1974.

The U.K. only suspended its major exchange controls in October 1979. Since this time U.K. investors are not required to pay a twenty-five percent premium on investment currency used to purchase foreign securities. Figure 3.1 dramatically emphasizes the impact which relaxation of exchange controls has had on investment in foreign securities in the U.K.market.

FIGURE 3.1
U.K.: INVESTMENT IN FOREIGN SECURITIES

PATTERNS OF UNITED KINGDOM INSTITUTIONAL INVESTMENT
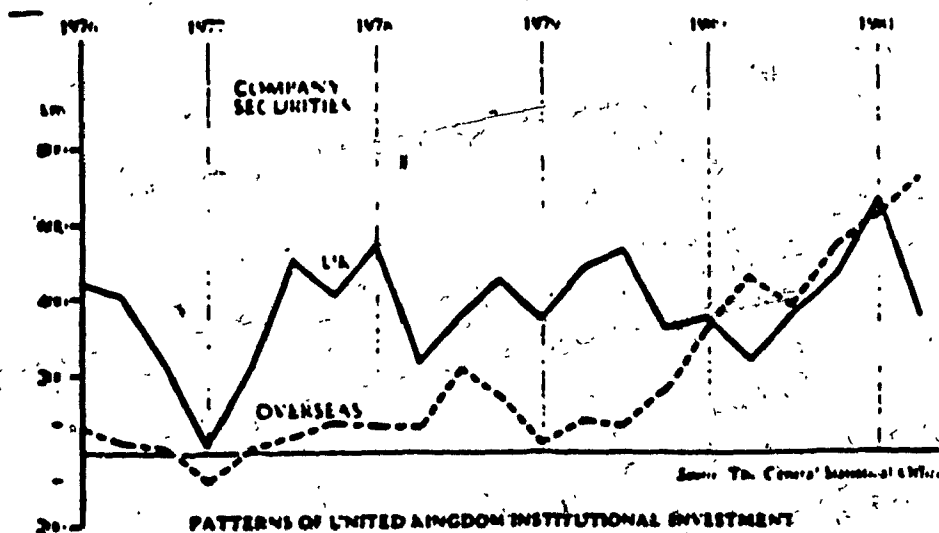
Source: London Listings for Overseas Companies. Barclays Merchant Bank
Limited, 1981, page 4.

3.4.2 INNOVATION AND INTEGRATION

In the evolution toward greater capital market integration, the role played by the changing infrastructure of the stock exchanges themselves bears examination. The revolution in communications technology has permitted virtually instantaneous transmission of data among exchanges. This means that some stocks, such as ALCAN, are trading on a twenty-four hour basis with the attendant benefits of increased liquidity. The stock exchanges of the European Economic Community (EEC) are in the process of linking. EUROMONEY (May 1984) reports that by the end of 1985 the market information systems of London, Amsterdam, Brussels, Paris, Copenhagen, Madrid, Milan, and Dublin will participate in the InterBourse Data Interchange System (IDIS). This network will convey real time price changes of, initially, two hundred and eighty companies. On the brokerage side, interactive networks linking the international brokerage firms are a reality and in addition, stockbrokers and investment banks are also developing their own systems. Ultimately, if the trend continues, the investor in New York can buy and sell on any world exchange without lag.[21] Correspondingly, the stimulation for international interlisting may be reduced as this comes to pass.

The changing environment of the international equity market has been accompanied by a greater information content associated with international interlisting. When firms interlisted in the past they did

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[21]This process is not without problems. While information is transmitted instaneously, the price data is not always comparable. Some exchanges transmit closing prices, others mid-day prices, etc. Therefore, the data transmitted must be interpreted with care.

so without benefit of specialists to follow these stocks as noted previously. After an initial surge in interest, many of these firms fell to obscurity. As discussed in Chapter One, brokerage and analysts services focusing upon international firms have proliferated in recent years. This increased attention, alone, could produce enhanced liquidity for the interlisted firm.

In summary, the past ten years have been a period of significant change for the international capital market. The preceding section has highlighted the role played by the removal of restrictions on exchange rate determination and technical innovation in the steck exchanges themselves, in potentially heightening the degree of world capital market integration. It is perhaps valid to conclude that the current environment of the Euroequity market is in part responsible for the ever rising number of internationally interlisted firms. Among the fifty-four interlisted TSE based firms included in the present research eighteen, or 33.33% interlisted between 1975 and 1983. In the previous fifteen year period fourteen, or 25.93% had interlisted; with twenty-two or 40.74% having interlisted prior to 1960. These statistics clearly portray the increasing importance of the phenomenon of international interlisting.

Notwithstanding the arguments which have been put forth regarding market integration, the fact remains that international interlisting can only be adequately explained within the context of the segmented market hypothesis. The firm which internationally interlists incurs a cost to do so and anticipates benefits of enhanced liquidity, perceived risk reduction, increased share price and possibly improved

access to international capital markets. In general, the absence of both implicit and explicit barriers to capital flows should ultimately assure the establishment of a fair market value for the firm in an efficient capital market. In principle, this benefit may be realized through trading in the deeper U.S. markets. The fact that international interlisting is observed at all is indicative of at least a degree of capital market segmentation. In the section which follows some specific sources of segmentation in the North American capital market are explored.

3.5 SEGMENTATION AND THE NORTH AMERICAN CAPITAL MARKET

In this section three possible causes of segmentation of the North American capital market are discussed. These are: the relative illiquidity of the TSE compared to AMEX and the NYSE, the difference in stock exchange disclosure requirements between Canada and the U.S., and the divergent accounting standards applied to Canadian versus U.S. firms.

3.5.1 LIQUIDITY OF THE TWO MARKETS

The Toronto Stock Exchange, unlike Amex and the NYSE, is a thin market.[22] The consequences of thin trading have been analyzed by Dimson (1979) in a theoretical framework and empirical results are reported for the London Stock Exchange. The results show that shares which are thinly traded will carry with them a greater perception of returns

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[22]For a discussion of the thin trading bias on the TSE see Fowler, Rorke and Jog (1979), and Tinic and West (1972).

stability and hence produce estimates of beta which are biased downward. The evidence provided by Fowler, Rorke and Jog (1979) regarding under estimation of risk on the TSE corroborates that obtained by Dimson (op.cit.). While the thin trading bias, in and of itself, should not serve to segment the North American capital market since efficiency criteria dictate such information would be available to U.S. as well as Canadian investors, it might well be the case that firms which possess identical systematic risk, if measured appropriately in the Canadian market, do not yield identical returns. Potentially, investors buying shares of firms exclusively listed on the TSE would demand a liquidity premium. Insofar as interlisting promotes increased liquidity of the firm's common shares, the thin trading source of segmentation may be attenuated. Furthermore, increases in trading volume might be expected to occur not only as a result of additional volume in the U.S. but also in Canada if interlisting promotes greater media attention from both the Financial Post and the Wall Street Journal. In the introductory chapter of this dissertation, the point was made that the evolution of the international equity market has produced a plethora of analysts and brokerage house which specialize in following interlisted firms and which ultimately enhances investor awareness of such firms. Not to be dismissed, in addition, is the potential for twenty-four hour trading as firms interlist not only in the U.S., but in London and Tokyo, as well.

The composition of market participants differs markedly in the U.S. and Canada and may well hold important implications for the liquidity of the interlisted firms. Booth and Johnson (1984) report that:

Consistently over the last fifteen years the proportion of individual trading by value has been around fifty percent, with about 5-10% percent unaccounted for as sales to dealers not registered to trade on the TSE. In contrast, trading by institutions and members of the exchange on the NYSE accounts for 80% of the value of trading....On the TSE, 81% of all transactions by volume come from individual investors or orders transmitted from non-member brokers whereas on the NYSE only 26% of all transactions come from individual investors.[23]

It was widely believed at one time that the ever greater role played by institutional investors would produce a decrease in market liquidity. Recent evidence provided by Reilly and Wright (1984), however, suggests that the opposite is true. Moreover, their results are consistent with the proposition that share volatility is inversely related to greater institutional trading.

The foregoing discussion holds important implications for the consequences of international interlisting. Through increases in liquidity brought about by institutional interest in the interlisted firms and heightened media attention, one may expect an immediate increase in the measured systematic risk of interlisted firms even when such risk is measured relative to the TSE index prior to and following the event. Any test of market efficiency must, of necessity take into account this empirical consequence of international interlisting or else risk mis-interpretation of either the presence or absence of abnormal returns.

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[23]L.D. Booth and D.J. Johnson, "The Ex-Dividend Day Behavior of Canadian Stock Prices: Tax Changes and Clientele Effects," _Journal of Finance_ 39 (June 1984) : 465.

3.5.2   DISCLOSURE REQUIREMENTS AND ACCOUNTING STANDARDS IN THE U.S. AND CANADA

Although presently there are no outright restrictions on capital flows between Canada and the U.S.[24], the differential disclosure requirements which govern the TSE versus AMEX and the NYSE are potential sources of segmentation in the North American capital market. Additionally, firms which list exclusively on the TSE do not receive the same following by financial analysts and reporters as do their U.S. counterparts. Consequently, the U.S. investor must spend more time and effort to seek out Canadian companies than would be the case for firms listed on major U.S. exchanges. The segmentation of the North American capital market might therefore be explained by an information gap.

Appendix I examines the accounting standards applied to Canadian firms and compares them with their U.S. counterparts. The accounting principles adhered to by Canadian firms are generally less rigid and may therefore be another possible source of the aforementioned information gap. The impact of differential disclosure requirements and accounting standards in the U.S. and Canada also play a role in determining whether or not a firm will interlist. Elaboration of this point is found in the following chapter.

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[24]FIRA and its successor Investment Canada, are probably the notable exceptions but they are relevant to the special circumstances of take-overs of Canadian firms by foreign companies.

3.6 SUMMARY

The purpose of this chapter has been to review the existing literature relating to the issue of capital market integration. Prior empirical tests relating to the structure of the world capital market have been unable to provide unequivocal support for either the integration or the segmentation hypothesis. In large part the questions surrounding world capital market structure remain unresolved due to the problems inherent in the methodologies employed to address the issue. This fact notwithstanding, it was argued in this chapter that the North American capital market should be considered as at least mildly segmented due to two important characteristics of the TSE--its relative illiquidity and less stringent listing requirements vis a vis U.S. exchanges. Differential accounting standards in Canada and the U.S. were also acknowledged as potentially segmenting. Thus international interlisting may provide concrete benefits to the firm in terms of enhanced share price and liquidity. Naturally, an integrated capital market would preclude advantages of this sort. Against the backdrop of the segmented market hypothesis, Chapter Four explores a more firm specific rationale for international interlisting.

CHAPTER FOUR
INTERNATIONAL INTERLISTING: AN EVOLUTIONARY PERSPECTIVE

Typically, the listing event has been analyzed within the framework of the efficient market hypothesis where the objective has been that of determining whether or not abnormal returns are in evidence during the period surrounding the event. Hence, the listing event itself is not examined per se, but rather its implications for capital market efficiency are emphasized in a manner similar to the treatment of stock price reaction to dividend announcements, stock splits, new financing, etcetera. One of the contributions of this dissertation is the development of a theoretical rationale which could aid in explaining the firm's decision to internationally interlist. In doing so it will be necessary to explore both the costs associated with interlisting and the benefits which might reasonably be expected to accrue from the undertaking.

The preceding chapter explored possible sources of North American capital market segmentation. In much the same way that Black (1974) identified a specific cause of segmentation, differential tax policies across countries, the observation that firms internationally interlist may be a further indicator of market segmentation. Although international interlisting is born out of a segmented market structure, what remains unexplored at this point are the reasons which compel a firm to undertake international interlisting. In this chapter the costs associated with international interlisting are explored in greater detail. Subsequently, it is argued that firms which interlist do so at a robust stage in their development such that the benefits accruing

therefrom outweigh the costs which are incurred. Adopting what is essentially an evolutionary perspective to the event of interlisting, permits the identification of firm specific behavior as the firm moves through an interlisting life cycle. Within this context the economic underpinnings of abnormal returns are explored, and thus the stage is also set for future investigation of the market efficiency implications of the international interlisting event. Indeed, it will be shown that there is every reason to believe that interlisting is accompanied by "abnormal" returns and that such returns would be consistent with market efficiency. Conversely, failure to detect "abnormal" returns is likely consistent with market inefficiency. The analysis of the economic underpinnings of "abnormal" returns is an important contribution to the conduct of event studies in general, which heretofore have largely ignored their impact.

4.1 THE COSTS OF INTERNATIONAL INTERLISTING

Prior to discussing the costs associated with international interlisting it is important to realize that not all firms can meet the minimum listing requirements imposed by either AMEX or the NYSE. Figure 4.1 on the following page illustrates the listing requirements of the TSE, AMEX, and the NYSE. Examination of this table reveals that smaller firms are excluded from interlisting. For those firms which do meet the eligibility criteria set forth by the U.S. exchanges, however, not all elect to interlist which leads to the supposition that the benefits of interlisting are not outweighed by the costs. Yet the direct costs of

TABLE 4.1

LISTING REQUIREMENTS OF THE TSE, AMEX, AND THE NYSE

CAPITALIZATION REQUIREMENTS

		TSE	AMEX	NYSE
1.	Minimum Market Value of Publicly Held Shares	$350,000	$3,000,000	$18,000,000
2.	Total Number of Shares Publicly Held	200,000	500,000	1,000,000
3.	Total Number of Shareholders Holding Round Lots	200	1,000	2,000

FINANCIAL REQUIREMENTS

		TSE	AMEX	NYSE
1.	Tangible Net Worth	$1,000,000	$4,000,000	$16,000,000
2.	Pre-Tax Income (cash flow)	200,000	750,000	2,500,000

Source: TSE, "Listing Requirement," circular #1, NYSE Fact Book, 1984, AMEX Fact Book, 1983.

interlisting on either AMEX or the NYSE are not prohibitive and would represent relatively small outlays for the firms. For firms wishing to list on AMEX the minimum initial fee is $20,000, with sustaining fees ranging from $3500 to $10,000. For NYSE companies, the minimum fee is $37,000 while continuing annual fees range from $10,800 to $54,000.[25] The more important costs associated with listing, however, may be those which arise from the necessity of meeting SEC and U.S. exchange disclosure requirements. Canada's five major banks, the Royal Bank, the Bank of Montreal, the Canadian Imperial Bank of Commerce, the Bank of Nova Scotia and the Toronto Dominion Bank are interlisted on the London Exchange. Representatives of these banks have cited the similarity of disclosure requirements with the TSE as the primary factor.[26] Aside from banks, other industrial groups are also conspicuously absent from the roster of interlisted firms. Among these are the breweries, including Labatt whose assets exceed that of the oil industrials. Cigarette firms do not interlist either. Of further interest is that even within specific industries one finds comparable firms some of which interlist and other which do not. For example, both Domtar and MacMillan Bloedel are interlisted, while Abitibi is not. A plausible explanation for the divergent listing patterns may be rooted in the high costs of disclosure on the U.S. exchanges. It is a well documented fact that accounting principles and practices are significantly different in Canada,

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[25]See AMEX, "Listing Foreign Securities" and NYSE, "Listing Standards and Procedures for Foreign Companies."

[26]Euromoney, May 1984, page 107.

providing for much more managerial discretion than in the U.S. As

R. Bloom notes:

> There is a great deal of emphasis on professional judgement in Canadian accounting standards, which are more guideline than notebook oriented in contrast to U.S. standards. Canada has far fewer standards than the U.S. (for example). There are no Canadian standards calling for capitalization of interest or present valuation of long term receivables or payables. The standards on extraordinary items and prior period adjustments provide broader definitions of these terms. The standards on research and development and marketable securities also give management greater latitude...[27]

Thus for many firms, in spite of low direct dollar costs, the legal implications of conflicting accounting standards may represent a major obstacle to interlisting on U.S. exchanges. An additional impediment to interlisting may have its origins in the fact that the companies' accountants and lawyers must comply with the registration requirements and guidelines of a multiplicity of stock exchanges. A survey of firms which have interlisted relatively recently was undertaken in an effort to determine with greater precision the costs of meeting disclosure regulations and accounting standards both initially and on an ongoing basis. The results of this survey are discussed in the following chapter.

4.2 AN EVOLUTIONARY PERSPECTIVE TO INTERNATIONAL INTERLISTING

The rationale for international interlisting derives directly from the at least mildly segmented nature of the North American capital market. In this context, it is hypothesized that firms which are growing

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[27]R. Bloom, "The Impact of Cultural Differences Between Canada and the United States on Canadian Accounting" (Paper presented at the EIASM Symposium, Amsterdam, June 1985), p. 8.

rapidly must look to U.S. markets to fuel ever increasing demands placed

by massive capital expenditure requirements. Thus a direct benefit of

interlisting may be the improved access to the foreign capital markets.

Relatedly, thin trading on the TSE may prompt firms to interlist as a

means of enhancing the liquidity of their common shares. As discussed

previously, such improvements could result in a lower cost of equity for

the firm. Due, however, to the more stringent listing requirements of

the U.S. exchanges and the hypothesized substantial costs associated

with interlisting, it would seem reasonable to argue that firms which

internationally interlist do so at a robust stage in their development

such that the benefits of interlisting outweigh these costs. As

discussed in Chapter Two, investigations of the listing event have

frequently noted that firms have enjoyed exceptional performance prior

to trading on a major exchange. This line of reasoning suggests that a

life cycle approach to the phenomenon of international interlisting may

be useful in describing the behavior of the firm as it moves from the

pre-interlisting phase through the currently interlisting phase to the

mature interlisting phase at which point the firm is assumed to be

entrenched on the foreign exchange. Before elaboration of the

interlisting life cycle an examination of the manner in which

evolutionary theories have been applied to other types of financial

economic phenomena is undertaken since to an extent, certain of their

implications will hold for the interlisting life cycle as well.

The use of life cycle theories to interpret financial economic

phenomena is not without precedent. The origin of the approach is

credited to Schumpeter (1934) who theorized that the marginal efficiency

of capital hinged upon the innovative techniques of firms. Both firm and economy wide growth and prosperity were presumed to derive from this crucial undertaking.

More recent attempts at viewing the economic progression of firms within the life cycle framework appear in the international finance sphere. Vernon (1966) proposes that the process of multinationalization of firms follows an orderly pattern. In what he calls the product life cycle approach to international investment, Vernon emphasizes the roles of scale economies, the timing of innovation and the roles of ignorance and uncertainty as determinants of trade patterns between nations and the eventual multinationalization of the firm. According to Vernon, the innovative firm initially exploits this advantage in the home market then services foreign markets via regular export channels. Once the production technology and product are standardized, the desire to achieve yet additional scale economies as well as to tailor the product to the tastes of foreign markets, is met through foreign direct investment activity in those markets. In an addendum to the product life cycle theory of multinationalization, Vernon (1977) argues that the mature multinational must adopt a policy of dynamic research generation to avoid falling victim to stagnation.

Related empirical work regarding the process of multinationalization is aimed at ascertaining whether or not predictable growth patterns can be uncovered. Buckley, Dunning, and Pearce (1978) offer evidence from their study of large multinationals which suggests that growth slows until a critical size is reached and then after this point there appears once again to be stimulus for further growth. The life

cycle approach is used by Schwartz (1984) in his analysis of merger activity. The empirical evidence he supplies refutes the hypothesis that technologically and/or chronologically old firms are more likely to merge.

The several studies cited previously have in common the implicit (or explicit) assumption that firms maximize shareholder wealth. This goal, however, is but one that can be pursued by the firm. The competing hypothesis of growth maximization is advanced by Cyert and March (1963). John Kenneth Galbraith's thesis in the New Industrial State (1967) is that corporations are not profit maximizers but rather, once a specific target profit level has been obtained the organizational goal of growth takes over.

In proposing a comprehensive life cycle theory of the firm, Mueller (1972) hypothesizes that it is precisely the growth maximization goal at the expense of shareholder wealth, which is pursued. Mueller argues that firms which are both chronologically and technologically old differ sharply with respect to their capitalization, return on investment and dividend policy. Initially, the firm as an innovator, behaves as a shareholder wealth maximizer, obtaining funds externally to finance exploitation of an innovation. As the opportunity for further exploitation of the innovation erodes, the firm gradually shifts to a posture of growth maximization. It begins to depend increasingly upon internal financing for projects, which in general earn returns less than those available to shareholders via re-investment of their dividends. Mueller contends that the life cycle theory of the firm is useful in explaining why the market will value dividends paid by mature firms

relatively more highly than those of non-mature firms. Grabowski and Mueller (1976) provide empirical evidence to this effect.

The life cycle theories discussed above focus upon the evolutionary process undergone by firms. The approach taken in this dissertation is consistent with this. However, what demarcates the various stages in the life cycle is the firm's "interlisting age", rather than its chronological or technological age. Furthermore, innovative behavior of a different sort than traditionally hypothesized is considered as pivotal in characterizing the stage of the firm's development. Rather than focusing upon the role of research and development in moving the firm along an evolutionary path, it is argued that financial innovation may reflect the changing character of the firm, and it is international interlisting itself, which is defined as the innovation. Three phases in the evolution of the firm are identified--the pre-interlisting stage, the currently interlisting stage, and the mature interlisting stage. Since admission to AMEX or the NYSE is restricted to those firms which have attained a specified threshold size and profitability, firms in the pre-interlisting stage will undoubtedly be smaller in terms of sales, and less profitable, than firms which are currently interlisting or have interlisted in the past. The currently interlisting stage should coincide with a robust phase in the firm's life cycle. Hence an increase in both sales and profitability may be observed when the firm moves from pre-interlisting status to current interlisting status. Such larger scale operations may in turn impose additional capital requirements on the firm which cannot be adequately met within the confines of the Canadian capital market.

Sustaining these performance levels once the firm is entrenched in the foreign market is unlikely, however, particularly if heightened sales and profitability are partly attributable to the firm's phase of development at the point of interlisting. This phase of limited stagnation is consistent with the chronological life cycle theory of Mueller (op.cit.), since such firms are older not only from an interlisting perspective but also in a strict chronological sense. The life cycle approach does not provide a rationale for interlisting. Nevertheless, given that the decision is taken by the firm to adopt an international listing profile, a distinctive phase in the life of the firm is identifiable. Moreover, the approach lends itself to an examination of the economic underpinnings of share price returns surrounding the event of interlisting. Thus, in a market efficiency study, abnormal returns, or indeed lack thereof, should be considered in light of the results obtained using this kind of analysis.

To summarize, in a very general way, it is argued that the firm interlists at a critical stage in its development and thus exhibits characteristics consistent with peak performance. In the mature interlisting phase, there is likely to be departures from the highs exhibited in the preceding stage, although the firm will continue to overshadow those firms which have not yet achieved interlisting status.

In the previous paragraphs it has been argued that the "age of interlisting" is a useful indicator in demarcating the stages a firm moves through in the interlisting process, and size and profitability patterns were identified as unique to each phase. In the paragraphs which follow certain other performance measures will be identified,

specifically, risk, growth in earnings per share, growth in capital expenditure, liquidity, and dividend payout, which are hypothesized to differ as the firm moves through the interlisting life cycle and which also will influence the share price performance of interlisted firms at the various stages in their life cycle. The proxy which is used for risk is the standard deviation of the ratio of operating income to net worth. This measure is consistent with the life cycle hypothesis which is postulated in that the riskiness of the firm should dissipate as the firm matures and a period of stable earnings is entered into. Of course, the systematic risk of the firm will also be affected by changes in capital structure such as occur, but this is a separate issue from that addressed by the measure of risk employed here. Consider the simple case of the unlevered firm. It's value can be expressed as:

(4.1) $V^u = (E(NOI)/\delta)(1-t)$

where: $E(NOI)$ = expected net operating income of the firm
        δ = the discount rate applied to the all equity firm
        t = the corporate tax rate
        V^u = the value of the unlevered firm

Thus the discount rate is expressed as:

(4.2) $\delta = (E(NOI)/V^u)(1-t)$

That is, the discount rate is equal to the ratio of net operating income to net worth multiplied by one minus the tax rate. Assuming a constant tax rate, this discount rate will vary as a result of changes in operating income and/or changes in the value of the unlevered firm. If changes in the value of the unlevered firm are non-stochastic, the standard deviation of the discount rate, $sd(\delta)$, is given by σ_u:

(4.3) $\sigma_u = sd(\delta) = ((1-t)/V^u)\sigma(NOI)$

The required rate of return on the unlevered firm is:[28]

(4.4) $\delta = E(R_j) = R_f + (E(R_m-R_f)/\sigma_m)(r_{um}\sigma_u)$

where: $E(R_m)$ - the expected return on the market
        R_f - the risk free rate
        σ_m - the standard deviation of the return on the market
        r_{um} - the correlation between the unlevered firm and   the
                     market

Thus changes in σ_u will directly impinge upon the return required by shareholders. As the firm moves through the interlisting life cycle then, ceteris parabus, as risk declines so will the equity return demanded by investors. The systematic risk is given by:

(4.5) $\beta = r_{um}\sigma_u/\sigma_m$

Thus the lower return is consistent with less systematic risk. It should be noted that the derivation here assumes non-stochastic changes in V^u. In practice, international interlisting may generate stochastic changes in the ratio of operating income to net worth, rather than exclusively in net worth, as is implied by the above derivation. Clearly, changes in this ratio, such as occur will impact upon the systematic risk of the firm as well. It would seem more appropriate therefore, to employ the standard deviation of the ratio of operating income to net worth, rather than the standard deviation of operating income on its own. It is expected that beta will rise as the firm moves through its pre-interlisting to currently interlisting phase and, then decline as the reduced variability in the ratio of operating earnings to net worth gets reflected in the systematic risk. Another important element of share

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[28]The development here applies to the simple case of the unlevered firm. For the levered firm a similar relationship between variability of operating income and systematic risk obtains. For derivation of the expressions contained here as well as those which apply to the case of the levered firm see Copeland and Weston (1983).

price determination is the liquidity of the firm's shares. Liquidity is measured here as the ratio of the volume of shares traded to the total number of shares outstanding on an annual basis. While an imperfect measure since price concessions are omitted, it does permit measurement of the stock's activity in all markets in which it is traded. Furthermore, the evidence provided by Switzer (1985) in fact indicates that price concessions are not made at interlisting and therefore the proxy which is used for liquidity may not seriously affect the conclusions which will be drawn regarding the relationship between liquidity and interlisting. As discussed elsewhere, thin trading is an acknowledged problem on the TSE,[29] although one could argue that firms which interlist are large and well-known and may not suffer from this problem to the same extent. Nevertheless a significant increase in liquidity relative to that of the pre-interlisting phase could occur. Merely due to the advertising value of an exchange listing, the heightened interest in the firm could produce an improvement in liquidity as foreign investors are made aware of the new investment opportunity which exists for international diversification on the domestic (U.S.) exchange. There is also reason to believe that increased interest by Canadian investors in interlisted stocks may occur. The transactions costs, on average, are higher on the TSE than they are foreign exchanges. Neave (1981) notes that:

> For lower-priced shares and smaller total transactions, Canadian stock exchanges' minimum commission rates are higher than those of

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[29]See Fowler, Rorke, and Jog [op.cit.].

exchanges in the United States, where commissions are determined through competition.[30]

Discount brokerage houses have operated in the U.S. since May 1, 1975 and regulated commissions in Canada were abandoned on April 1st, 1983. Since deregulation there has been a marked decline in brokerage commissions in Canada but on average rates remain higher than those charged in foreign markets.[31] For the last quarter of 1985 the average commission per dollar valued traded on the TSE was .94% which exceeds the .63% average for U.S. and foreign market originated trades which are cleared through the TSE.[32] Thus it appears advantageous for a Canadian investor to purchase Canadian shares outside of Canada and this may also account for increased liquidity once the firm interlists. In summary, due to the higher profile for the company once interlisting occurs and the lower brokerage commissions on U.S. exchanges, liquidity likely increases as the firm moves from the pre-interlisting to currently interlisting stage perhaps falling off somewhat thereafter as some of the interest generated by interlisting flags. Such a finding would suggest the presence of abnormal returns during the interlisting period. Conventional event studies, as of the type to be carried out in this research, should take into account the impact of confounding events.

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[30]Edwin H. Neave, _Canada's Financial System_ (Toronto: John Wiley and Sons, 1981), p. 294.

[31]For a discussion of the impact of discount brokerage houses in the U.S. see S. Tinic and R. West, "The Securities Industry Under Negotiated Brokerage Commissions: Changes in the Structure and Performance of New York Stock Exchange member firms", _The Bell Journal of Economics,_ 11 (Spring 1980) : 29-41. Comparisons of Canadian and foreign commission rates may be found in _RAMA Research_, Report prepared by the Management Services Division of the Toronto Stock Exchange.

[32]Information obtained from the TSE.

Typically, however, this is a cumbersome undertaking. Yet the underlying motivation for international interlisting, if indeed it does derive from the need to meet increasing capital expenditure requirements outside the geographic confines of the Canadian capital market, may point to substantive confounding events during the interlisting period. In particular, firms which interlist could be increasing their capital expenditure up to and including the point of international interlisting. This would provide an additional explanation for share price enhancement occurring coincident with interlisting to the extent that announcement of investment plans coincides with positive stock price reaction. Miller and Rock (1982) demonstrate this proposition theoretically. More recently McConnell and Muscarella (1985) provide empirical evidence that supports the hypothesis that announcements of increases (decreases) in capital expenditure intentions are accompanied by share price increases (decreases) for industrial firms.

Changes in dividend policy may occur coincident with international interlisting. The relevant issue, however, is how changes, such as occur, will affect the pricing of the firm once interlisting takes place. To address this issue, several related questions should be posed. First, are dividend announcements accompanied by abnormal returns? If so, it may be the case that a test of market efficiency which uncovers abnormal returns around the interlisting event may be picking up returns associated with changes in dividend policy. Secondly, do investors value dividends more highly than capital gains and is there a difference between Canadian and U.S. attitudes in this regard? Specifically, are changes such as are observed in the dividend policies

of Canadian firms, consistent with U.S. dividend policies and thus perhaps indicative of U.S. pricing of interlisted firms?

Numerous studies argue that dividends convey positive information about the firm's future performance and thus share price appreciation in response to dividend announcements is consistent with market efficiency.[33]

As regards the existence of a clientele effect which exhibits a preference for dividends over capital gains, the empirical evidence is mixed. Long (1978) in his case study of Citizens Utilities uncovers a decided preference for cash dividends. Poterba (1986) re-examines the dividend policy of Citizens Utilities and his findings conflict with those of Long. In the Poterba study the market appears to value the stock dividends of Citizens Utilities more highly than cash dividends. Litzenberger and Ramaswamy (1980) determine that there is a decided tax disadvantage associated with cash dividends which will be reflected in share prices. Still other studies, including Elton and Gruber (1970) and Pettit (1977) provide evidence that low dividend stocks are preferred by high income-high tax bracket investors. Although the empirical evidence regarding a Canadian clientele effect is scant, Morgan (1980) finds that dividends and capital gains are prefect substitutes for one another. More recently Booth and Johnston (1984) provide results which suggest that in Canada there is a market preference for capital gains over dividend income. Furthermore, they suggest that a distinction exists

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[33]See, for example, Fama, Fisher, Jensen, and Roll (1969); Pettit (1972), Kwan (1981), and Aharony and Swary (1980).

between the price behavior of firms which are exclusively listed on the TSE and those that are interlisted. That is:

> Both the level and trend in the ex-dividend day price ratio supports the assertion that the prices of listed and interlisted stocks are determined by different clienteles. For 1970-1971, when the US-Canadian tax treatment produced the largest differences in the implied ex-dividend day price ratios,[34] the two samples have statistically different mean values at the 1% level. In subsequent years, as the changed Canadian tax treatment brought the implied dividend day price ratios more in line with those for high tax bracket stocks in the U.S., the difference is less significant. Overall, the evidence is suggestive that the interlisted stocks have their prices determined by American and not Canadian investors,...[35]

As mentioned previously there is reason to suggest that the dividend policy of the firm changes as it moves through the interlisting life cycle. Consistent with the hypothesized rapid growth of the first two stages of interlisting and the proposition that the Canadian capital market may be unable to provide the needed funds to fuel such expansion, dependence upon internal sources of financing would be consistent with relatively low dividend payout ratios during the first stages. Once interlisting is accomplished, the firm may increase its dividend payout since it now has access to deeper markets for external financing and in the mature phase, the demands for financing may have been curtailed somewhat as well. Such increases would also be consistent with Mueller's (op.cit.) chronological life cycle theory of the firm wherein it is argued that the market values more highly the dividends paid by mature firms relative to newer firms. Lastly, the small firm effect, to the

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[34] The ex-dividend day price ratio equals the ex-dividend day price change divided by the dividend per share.

[35] L. D. Booth and D.J. Johnston, "The Ex-Dividend Day Behavior of Canadian Stock Prices: Tax Changes and Clientele Effects," _Journal of Finance_ 39 (June 1984) : p. 475.

extent it is operative as the firm move from the pre-interlisting to the currently interlisting stage may play a significant role in the interpretation of "abnormal" returns, such as are found. During the pre-interlisting and currently interlisting phase of the life cycle, the firm is in a rapid growth phase as it moves to attain the threshold size required by the U.S. exchanges. Givoly and Lakonishok (1985), offer an explanation of the small firm effect which hinges upon the market's consistent underestimation of the earnings potential of small firms. They provide evidence to the effect that abnormal returns to small firms are not inconsistent once their underlying economic performance is reviewed. Turnbull (1977) derives a variant of the CAPM in which he demonstrates that systematic risk is a non-linear function of the growth in earnings of the firm. He argues that as earnings grow, systematic risk does not increase and may even decrease. Within the context of the life cycle approach to interlisting, firms in the pre-interlisting phase are expected to enjoy much higher growth in earnings per share than in other phases, and consistent with the limited stagnation of the mature phase, earnings growth should level out. Thus analogous to the small firm effect, it is anticipated that "abnormal" returns should occur during the period surrounding interlisting, but if Turnbull's thesis is born out, they should be indicative of greater risk at this time as well.

In summary, viewed from an evolutionary perspective, international interlisting is hypothesized to occur at a robust stage in the firm's development and if evidence is provided to this effect, then detection of "abnormal" returns within the context of event study

methodology, is entirely compatible with the efficient market hypothesis. In this setting, market prices are reflecting the underlying improved economic performance of the firm as it peaks during the currently interlisting phase in terms of profitability. In addition, share price appreciation may also be due in part to the additional capital expenditure and increase in dividends that may occur coincident with international interlisting. Lastly, the small firm effect, to the extent it is present, may play a significant role in the detection of "abnormal" returns. Reasons were also advanced that suggest that heightened systematic risk may accompany the interlisting event due to changes in operating income and changes in the growth of the firm's earnings. Thus tests of market efficiency must necessarily consider the economic underpinnings of the firm prior to declaring abnormal returns indicative of market inefficiency. In Chapters Six and Seven of this dissertation the methodology employed is discussed fully. Empirical results are presented which lend strong support to the arguments that an interlisting life cycle exists and that "abnormal returns" when measured conventionally, are consistent with market efficiency criterion.

CHAPTER FIVE
THE MOTIVATION AND COSTS AND BENEFITS OF INTERNATIONAL INTERLISTING: THE FIRM RESPONSE

Central to this thesis is the hypothesis that segmentation of the North American capital market has played a decisive role in determining whether or not a firm will internationally interlist. Relatedly, firms may expect benefits of share price enhancement and improvements in share liquidity as a consequence of trading in deeper markets characterized by greater activity on the part of institutional investors. It is further conjectured that real changes in systematic risk may occur coincident with international interlisting. The need to access U.S. capital markets in order to fuel ever increasing capital requirements was accorded a pivotal role in inducing a firm to internationally interlist. Offsetting such potential benefits to the firm, however, are the costs associated with interlisting which are thought to be substantial. In order to better understand both the factors motivating the firm to interlist and the related costs, a survey of firms which have recently interlisted either on AMEX or the NYSE, was undertaken. A copy of the questionnaire which was sent as a follow up to telephone interviews conducted with Treasurers or Vice-Presidents finance of the companies polled is contained in Appendix II. In order to preserve confidentiality, the firms will not be disclosed.

In most, but not all cases, the firm initiated the idea to interlist in the U.S. Interest was apparently motivated by a desire to enhance both the price and liquidity of traded shares as well as to promote access to the deeper U.S. capital market. In regard to the cost of interlisting, the direct dollar costs were not considered high. As

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anticipated, however, the indirect dollar costs of listing were deemed to be significant. The cost of initially listing on either AMEX or the NYSE, over and above the direct dollar cost incurred, was estimated to be as high as $500,000, although the figure varied substantially among companies. Similarly, for some firms, the indirect dollar cost of maintaining the listing was reported to be in excess of $250,000 annually, although several firms reported more modest costs. Likely the discrepancies arising among firms are attributable to the difficulty which some may have encountered in isolating the legal and accounting costs attributable to the interlisting activity from the firm's total legal and accounting costs. Nevertheless, the majority of firms reported six figure estimates for both initial and ongoing costs. This evidence supports the contention made in a previous chapter that substantial costs are likely to be encountered by the interlisted firm.

When asked whether or not compliance with the Securities and Exchange Commission regulations served as a deterrent to international interlisting, no respondent in the survey acknowledged unwillingness to disclose information. Rather, the high cost of such disclosure was emphasized. This evidence notwithstanding, there may be for some firms a genuine reluctance to disclose the information required by the S.E.C. There exists some anecdotal evidence in support of this argument. Euromoney (May 1984), reported that some firms do not wish to hamper their competitive position by releasing information which their competitors could then freely access. In an interview with John Hartley, a director of International Signal and Control, (ISC), several reasons for avoiding a New York listing were cited. Above the direct dollar cost

of listing and the complicated procedures for listing required by New
York, Hartley stated that the "... level of disclosure required by the
SEC is not only expensive, it is commercially dangerous."[35] It may be
that for some Canadian firms the disclosure requirements may be a
sufficiently important consideration such that interlisting in the
U.S. is proscribed.

As regards the success of international interlisting, almost all
firms replied that the objectives which they had established for this
activity were fulfilled. Since all firms had incurred a sizeable
capital expenditure in order to internationally interlist and all
remained interlisted, this reply was not unexpected. On the other hand,
for some firms the costs incurred appear not to be outweighed by the
benefits received. Certain firms may elect never to seek interlisting
as noted in the previous chapter. Some will seek delisting. In this
regard, MacMillan Bloedel Ltd., which interlisted on New York in
December 1979, recently announced that it would seek shareholder
approval for delisting of its shares. While a dollar figure of $36,000
was cited as the cost of sustaining an NYSE listing, this amount
quite likely reflects only the direct dollar cost involved. Indeed the
company stated that their NYSE listing status required too much
expenditure of management time in order to comply with the NYSE rules.[36]

Finally, when asked why the NYSE was selected over AMEX, where

[35]Quek Peck Lim, "Why Wall Street Was Shunned," Euromoney (May
1984) : p. 109.

[36]See "MacBlo Seeks NYSE Delisting," The Globe and Mail
Report on Business, Thursday, March 6, 1986, p. B1.

applicable, the prestige of an NYSE listing was cited. No consensus was obtained for AMEX listed firms.

In summary, the results of the survey indicate that international interlisting is a costly undertaking, both in terms of the initial outlay required and the sustaining fees incurred. Firms anticipated concrete benefits from the activity and the majority of firms in the sample reported that such benefits were obtained. In the chapters which follow the economic performance of interlisted firms is analyzed in detail as well as the nature of the benefits received from interlisting.

6.1 INTRODUCTION

In Chapter Four the life cycle theory of international interlisting was proposed. A principle advantage of adopting this analytical framework lies in its potential for describing firm behavior from an evolutionary perspective and, relatedly, in the possibility of uncovering underlying economic variables that may aid in explaining the market response to international interlisting. In this chapter the methodological approaches adopted in the investigation of the life cycle hypothesis are described and the empirical results obtained in the implementation of the research design are analyzed.

6.2 METHODOLOGY

In modelling the economic underpinnings of security returns, two approaches are adopted. First, basic descriptive statistics will be presented and second, a more formal modelling process, that of multinomial logistic regression is developed.

Prior to outlining the techniques that are employed, a brief description of the data is in order. Congruent with the life cycle hypothesis, in a given year beginning in 1969 through to 1980, firms which are listed on the TSE are separated into four mutually exclusive categories as follows: those that have interlisted in the past, those currently interlisting, those firms which will interlist in the future and those firms that have not yet interlisted as late as the end of 1983. Empirical analysis is carried out on successive poolings of

cross-sectional data obtained from the Compustat Industrial Data Tape
and augmented by the Financial Post Fundamental Data Bank. That is,
cross-sectional data consisting of firms observed in 1970 were added to
the cross-section observed in 1969, and the cross-section of firms
observed in 1971 was added to the two previous cross-sections,
etcetera. The successive pooling of cross-sectional data continued year
by year until the final cross-section of firms observed in 1980 was
added. The non-interlisted category is not pooled. While firms which
begin their interlisting life cycle in the pre-interlisting category
will eventually pass on to the mature interlisted category, the
composition of the non-interlisted category is relatively stable from
one year to the next. Whether or not a firm is considered to fall into
the future or past interlisting category naturally depends upon the
definition of current which is employed. The currently interlisting
category was defined over a three year period. Defining current in this
manner dismisses the possibility that excellence in performance such as
is observed, is of a highly transitory nature and therefore perhaps
attributable to "window dressing" efforts on the part of the firm when
the time comes to meet the foreign listing requirements. For example,
for the first cross sectional pooling, the year 1969, currently
interlisting firms are defined as those which will interlist in the
years 1969, 1970, or 1971. Pre-interlisting firms are those which will
interlist after 1971 and mature interlisted firms are those which
interlisted prior to 1969. It should be noted that not all firms which
are internationally interlisted enter into any one of the three pooled
interlisting categories for all given years. This is due to

unavailability of data for the firm in a given year.[37] The total number
of firms which have internationally interlisted to the end of 1983 is
fifty-two. The names of these firms together with their interlisting
dates appear in Appendix III. One important observation should be made
regarding firms included in the Compustat Data Bank. Data for all
non-interlisted firms were derived exclusively from this source. This
data bank includes only the largest among Canada's industrial firms and
as a result all included firms would meet the listing requirements in
terms of size and profitability which have been established by either
AMEX or the NYSE.

Descriptive statistics are employed using the following
variables: sales, ROI, risk, capital expenditure, growth in long-term
debt, dividend payout, and liquidity.[38] Analysis of variance (ANOVA)
tables are constructed in order to compare the means of each of these
variables across all categories. The null hypothesis is that there is no
difference among the means of a given variable across categories. The F
statistic is used in ANOVA as the test statistic. Use of the F statistic
implies that all sample observations are independent, each category is
normally distributed, and that the variances, for a given variable, in
each category are equal. The consequences of violating these

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[37]To be precise, in order to be included the firm must have had
the following characteristics: operating income and net worth must be
available over a five year period preceding the year in question so that
the risk measure could be calculated. Furthermore, net worth, earnings
available for common, and total shares outstanding could not equal
zero. Finally, a firm could not exhibit either, long term debt or
earnings per share of zero since the annual change in these variables
would be undefined.

[38]These variables were defined in Chapter Four. A concise
listing of these definitions are also found in Appendix IV.

assumptions are discussed on page 90. While ANOVA addresses the question
of whether the means are equal for a given variable, should this null
hypothesis be rejected it is instructive to compute the difference in
the means of variables between classes in order to identify if all, or
only certain of the means are statistically different. The Tukey-Kramer
method is used to test the hypothesis that the mean of a given class
differs from that of another.

While descriptive statistics are useful as a means of generally
identifying the characteristics of firms in a given interlisting class,
to directly assess the relationship between the pre-defined variables
and the appropriate interlisting class the multinomial logit (ML) model
which belongs to the class of qualitative response models is adopted. It
is generally considered superior on statistical grounds, to multivariate
discriminate analysis, (DA) since the ML model yields more efficient
estimation of parameter values than does the DA model.[39] What is perhaps
more important for the purpose at hand is the fact that the ML model,
unlike the DA model, focuses attention upon the estimation of the
parameters which characterize each alternative, rather than focusing
upon discrimination itself which is the primary task of DA models. The
ML model has been widely used in the analysis of economic problems,
including that of household portfolio choice which was studied by Uhler

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[39]See Takeshi Amemiya, "Qualitative Response Models: A Survey"
[1981], The Journal of Economic Literature, 19 : 1483-1536, for a concise
discussion of the relative efficiency of parameter estimates in ML and
DA models.

and Cragg (1972), and the effects of wage subsidies treated by Perloff and Wachter (1979), to mention only a few.[40]

Multinomial logistic regression is used to assess the extent to which specified variables influence the probability that firms will be classified as mature interlisted, currently interlisted, non-interlisted, or pre-interlisted. Multinomial logit analysis is a member of the family of discrete regression models and represents the general case of the binary choice logit model. In the case of multinomial logit analysis there are "m" categories and where "m" equals 2, the binomial logistic regression model obtains. For purposes of exposition the logit model is first derived and then extended to the general, multinomial case.

Let us begin with the usual regression model expressed in vector form and Y_i an element of Y as follows:

(6.1) $Y = \beta'X + u$

where: $E(u) = 0$
         $E(Y|X) = \beta'X$

For a dichotomous choice problem Y_i takes on values of either zero or unity. Similarly, u is constrained to take on values of $(-\beta'X)$ when Y_i equals zero and $(1-\beta'X)$ when Y_i equals unity; and therefore is not normally distributed. More importantly, note that $E(Y|X)$ can lie outside the limits of $(0,1)$.

Redefine the regression relationship in (6.1) as follows:

(6.2) $Y^* = \beta'X+u$

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[40]Amemiya (op.cit.) reviews several more applications of ML models in economics.

Then define a dummy variable "Y_1" which has the following properties:

(6.3) $Y = 1$ if $Y_1^* > 0$
        $Y = 0$ otherwise

From (6.2) the probability that ($Y=1$) is given by

(6.4)   Prob ($Y=1$) = Prob($u > -\beta'X$)
                    = $1-F(-\beta'X)$

where: F = the cumulative distribution function for u.

To obtain the logistic regression model it is assumed that u_i in equation (6.4) possesses a Sech^2 distribution. The density function is given by:

(6.5) $f(u) = (e^u)/((1+e^u)^2)du$; $-\infty < u < \infty$

and the cumulative distribution function is:

(6.6) $F(z) = (e^z)/(1+e^z)$

Equation (6.6) is the logistic function. Using (6.6) the probability that the event occurs can be expressed as:

(6.7a)   Prob($Y=1$) = $(1-F(-\beta'X)) = F(\beta'X) = (e^{\beta'X})/(1+e^{\beta'X})$

Similarly, the probability that the event does not occur is given by:

(6.7b)   Prob($Y=0$) = $(1-F(\beta'X)) = 1/(1+e^{\beta'X})$

In making the transition to the multinomial logistic regression model, the spirit of the binary choice model is conserved. Within the context of the present research four categories of firms are considered. The ratio of the probability that firm is not interlisted to the probability that it is interlisted is given by:

(6.8) $P_m/(1-P_m) = F(\beta'_m X)/(1-F(\beta'_m X)) = G(\beta'_m X)$

where: $F(\beta'_m X)$ = the cumulative distribution function as before

        $G(\beta'_m X)$ = the density function.

and: β'_m - the coefficients to be estimated for X in class m.

Equation (6.8) implies that:

$(6.9)^{41}$ $P_m = \{G(\beta'_m X)\}/\{1 + G(\beta'_m X)\}$

Assuming that the functional form of F_m is the logistic, by simplification and substitution we can write:

$(6.10)^{42}$ $G(\beta_m'X) = e^{\beta_m'X}$

Thus the probability that the firm is not interlisted is given by:

(6.11) $P_m = \{e^{\beta_m'X}\}/\{1 + e^{\beta_m'X}\}$

Note that (6.11) is identical to (6.7a), the probability that the event occurs in the binary choice logistic regression model.

Making use of the fact that:

(6.12) $P_m = 1 - \sum_{k=1}^{m-1} P_k = 1 - \sum_{k=1}^{m-1} F(\beta_k' X) = F(\beta'_m X)$

It follows that:

(6.13) $P_m = 1/(1 + \sum_{k=1}^{m-1} \beta_k'X)$

Thus:

(6.14) $P_m = (e^{\beta_m'X})/(1+e^{\beta_m'X})=1/(1+\sum_{k=1}^{m-1} e^{\beta_k'X})$

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[41] From (6.8) we have:

$P_m = (1-P_m)G(\beta_m'X) = G(\beta_m'X) - P_m[G(\beta_m'X]$

$P_m + P_m[G(\beta_m'X)] = G(\beta_m'X)$

$P_m(1 + G(\beta_m'X)) = G(\beta_m'X)$

Thus: $P_m = \{G(\beta_m'X)\}/\{1+G(\beta_m'X)\}$

[42] From (6.9) we have:

$G(\beta_m'X) = \{(e^{\beta_m'X})/(1+e^{\beta_m'X})\}/\{1 - ((e^{\beta_m'X})/(1+e^{\beta_m'X}))\}$

$G(\beta_m'X) = \{(e^{\beta_m'X})/(1+e^{\beta_m'X})\}/\{(1+e^{\beta_m'X}-e^{\beta_m'X})/(1+e^{\beta_m'X})\}$

Define the probability that the firm is in one of the interlisting classes, the pre-interlisting class for example, as:

(6.15) $P_k = F(\beta_k'X)$

or:

(6.16) $P_k = e^{\beta_k'X}/(1+\sum_{k=1}^{m-1} e^{\beta_k'X})$

Thus:

(6.17) $P_k/P_m = \{(e^{\beta_k'X})/(1+\sum_{k=1}^{m-1} e^{\beta_k'X})\}/\{1/(1+e^{\beta_k'X})\}$

Similarly, the ratio of the probability that the firm is currently interlisting, P_j, for example, to the probability that it is not interlisted is given by:

(6.18) $P_j/P_m = \{e^{\beta_j'X}/(1+\sum_{k=1}^{m-1} e^{\beta_k'X})\}/\{1/(1+e^{\beta_k'X})\}$

Thus, we can now offer a straightforward interpretation of the beta coefficients. Let Q_{jt} be the odds favoring currently interlisting status over pre-interlisting status at time t.

That is:

(6.19) $Q_{jt} = [P_j/P_m]/[P_k/P_m] = \exp[X_t'(\beta_j-\beta_k)]$

Note that:

(6.20) $\delta logQ_{jt}/\delta X_t = \beta_j-\beta_k$

Thus, the coefficients β_j may be interpreted as the partial derivatives of the logarithm of the odds in favor of alternative "j", currently interlisting in this example, over alternative "k", pre-interlisting in this example, with respect to an increase in the explanatory variables, X_t.

To obtain identification it is necessary to impose some constraint on the β vectors. In this study it was assumed that the vector of coefficients associated with the alternative of not being

internationally interlisted equalled zero, $(\beta_3=0)$. Interpretation of results is unaltered if another vector of β coefficients is suppressed.

The likelihood function for the multinomial logit model is given by:

$$(6.21) \quad L = \prod_{i=1}^{n} P_{i1}^{Y_{i1}} P_{i2}^{Y_{i2}} \ldots P_{im}^{Y_{im}}$$

or:

$$(6.22) \quad \text{Log } L = \sum_{i=1}^{n} \sum_{j=1}^{m} Y_{ij} \log P_{ij}$$

The maximum likelihood estimates of the β coefficients are obtained by solving:

$$(6.23) \quad \sum_{i=1}^{n} (Y_{ik} - P_{ik}) X_i = 0, \quad (k=1,2,\ldots,m-1)$$

From (6.23) it can be seen that "P_{ik}" is a non-linear function of all the coefficients. Thus a non-linear optimization technique must be used. In this research the Davidon-Fletcher-Powell algorithm is used.

Prior to estimating the parameters of the multinomial logit model, the extent of correlation between variables was examined in order to ascertain whether or not the variables are highly correlated and thus likely to produce multicollinearity in the estimation of the ML model. Since sales produced high correlation with capital expenditure the sales variable was omitted from the multinomial logit analysis.

6.3 ANTICIPATED RESULTS

Before presenting empirical results regarding the investigation of the economic performance of interlisted firms it is useful to review in broad terms what results are anticipated if the life cycle theory of international interlisting is to be empirically supported. Recall that Chapter Four provided greater detail in this regard.

Briefly, size is expected to increase as the firm moves through the interlisting life cycle, consistent with the listing requirements imposed by the U.S. exchanges, and also with the argument that access to the deeper U.S. capital market plays a major role in stimulating the interlisting decision.

For firms in the pre-interlisting category and the currently interlisting category dividend payout will likely be less than that exhibited by non-interlisted firms. Within the context of the multinomial logit model, the probability that a firm is pre-interlisted is enhanced the smaller is dividend payout. An increase in dividend payout would favor the odds that the firm is mature interlisted over the two other interlisting categories. Furthermore, tangential evidence in support of Booth and Johnston's (1984) contention that interlisted firms are priced in the U.S. may be uncovered if it is found that increases in dividend payout favor a firm having mature interlisted status over the alternative that the firm is not interlisted.

As regards risk, it is expected that the probability that the firm is in the currantly interlisting class versus the pre-interlisted class or the mature interlisted class will increase, the greater is risk. Such a result would be consistent with heightened returns during the interlisting period. In keeping with the proposition that firms will enter a phase of limited stagnation once mature interlisted status is attained, it is expected that increases in return on investment will favor the probability that the firm is pre-interlisting or currently interlisting versus the alternative that it is mature interlisted. In

other words, profitability as measured by ROI, is expected to first rise and then decline as the firm moves through the interlisting life cycle.

Capital expenditure is expected to continually grow throughout the stages of the cycle since one of the motivating forces behind the decision to interlist may be the inability of firms to meet their growing capital expenditure requirements. As a result, increases in capital expenditure are expected to enhance the probability of the firm being mature interlisted versus being non-interlisted, followed by current, and lastly pre-interlisted. The financing of such capital expenditure is also examined by investigating annual changes in long-term debt. It is argued that prior to interlisting firms may attempt to meet relatively more of their capital expenditure requirements through long-term debt than will be the case once the firm has interlisted and thus permitted greater facility of access to the U.S. stock markets. Accordingly, the probability that a firm is pre-interlisting versus the alternative that it is currently interlisting is likely increased the greater is the annual change in long term debt. A similar result is anticipated to hold with regard to the mature interlisted category.

It was argued in Chapter Four that international interlisting may be accompanied by increases in the liquidity of the firms shares which may be brought about by the publicity accompanying the event itself in addition to the fact that once interlisted the firm will trade in a deeper market. Nevertheless, since firms which interlist are quite likely already well known in Canada, it is possible that firms in the pre-interlisting stage will be more liquid than their non-interlisted

counterparts. On the other hand, if international interlisting is also viewed as tool by which the general profile of the firm is highlighted, firms which are less liquid with regard to the Canadian market in general, may be prompted to interlist. Thus the possibility that liquidity is negatively related to the probability of a firm being pre-interlisted versus non-interlisted is not ruled out. It is expected, however, that increases in liquidity will favor currently interlisting firms versus non-interlisted firms and similarly the probability of being mature interlisted is increased the greater is liquidity, when compared to the alternative of being non-interlisted. Since international interlisting is accompanied by a great deal of media attention which is unlikely to be sustained at that level long term, liquidity may taper off somewhat as the firm moves from the currently interlisting stage to the mature interlisted stage. Thus increases in liquidity likely favor the odds that the firm is currently interlisted versus the alternative that it is mature interlisted. Finally, in keeping with the proposition that international interlisting is usefully described within an evolutionary framework, firms in the pre-interlisting category likely experience much greater growth in earnings per share than all other groups of firms. Furthermore, while growth will continue at a less rapid rate during the currently interlisting phase, once the cycle of limited stagnation is approached, decreases in growth in earnings per share are expected. As discussed in Chapter Four, if empirical support is lent to the interlisting life cycle, then there is reason to believe that "abnormal" returns may

accompany the event of international interlisting while at the same time being consistent with market efficiency.

6.4 EMPIRICAL RESULTS

In this section the empirical results relating to key economic variables of the firm are presented. First the descriptive statistics are briefly reviewed then the results of the multinomial logistic regression are analyzed. Average values for the following variables: sales, roi, dividend payout, capital expenditure, the percentage change in long-term debt, risk, liquidity, and the percentage growth in earnings per share are calculated for each of the previously defined listing categories. The results of the analysis of variance are found in Table 6.1 which follows on the next page.

In Table 6.1 it can be seen that the null hypothesis of equal means is rejected for sales, capital expenditure, liquidity, and return on investment. Thus based on this criterion we may conclude that the four sample groups are drawn from distinct populations. For dividend payout, growth in earnings per share, risk and the annual percentage change in long-term debt, the F statistic is not significant and hence it is not possible to reject the null hypothesis of equal means. It should be pointed out, however, that for the variables dividend payout, and risk, although the F statistic is not significant, its value exceeds unity suggesting that more inter-group variation relative to intra-group variation is present. Caution should be exercised in interpreting the ANOVA results. While the F-test is robust against departures from

TABLE 6.1
ANALYSIS OF VARIANCE
DIFFERENCE IN MEANS BETWEEN GROUPS
(Dollar figures in millions)

	TOTAL SAMPLE	PRE	CURRENT	MATURE	NON	F STATISTIC
SALES	$909.39	$461.35	$909.46	$1130.22	$591.78	8.138*
CAP. EXP.	$107.23	$36.72	$56.50	$149.00	$52.03	10.875*
LIQ.	17.73%	13.70%	25.31%	18.94%	15.16%	3.326*
DIV.	47.40%	10.82%	16.43%	56.56%	45.01%	1.161
EPS	18.65%	93.54%	24.85%	23.51%	-14.62%	0.978
RISK	14.73%	8.60%	15.45%	10.97%	24.05%	1.050
ROI	13.99%	14.40%	15.66%	13.33%	14.91%	2.610*
DEBT	-4.41%	5.66%	-6.22%	-7.67%	-0.48%	0.090

Symbols: CAP. EXP. - Capital Expenditure, LIQ. - Liquidity, DIV. - Dividend Payout, EPS - Growth in EPS, DEBT - Growth in Long-term debt.

Significance: (*) significant at .005

normality, when sample sizes are unequal and variances are unequal, use of the F-test could lead to incorrect statistical inference. Non-independence of observations will have a similar undesirable consequence. However, the assumption of independence can be justified by appealing to previous empirical work by Cragg and Malkiel (1970) who find that past values of financial variables have little predictive ability in explaining future price/earnings ratios. Moreover, rejection of the null hypothesis does not provide information regarding which of the means across categories are unequal. To address the latter question

the Tukey-Kramer method is used. Tables 6.2 through 6.10 present the results of this analysis. Group averages are shown in bold on the diagonals. An asterik in the off-diagonal elements indicates that the difference between means is statistically significant at .05.

As can be seen in Table 6.2, firms in the mature interlisted category are larger, on average, than those exclusively listed on the TSE or those which are currently interlisting or will do so only in the future. Size, as measured by sales, thus appears to increase as the firm move through the interlisting life cycle, although the difference in average sales between the currently interlisting and mature interlisted phase is not significant. Significant differences in size are evident, however, between the mature interlisted group and the non-interlisted group, and between the mature interlisted stage and the pre-interlisting stage. No significant difference in average sales is detected between non-interlisted firms and pre-interlisting firms. Thus any distinction which is observed among firm size appears to occur only between firms which have interlisted in the past and those which either never will interlist or will do so only in the future. Re-examination of Table 6.2 also suggests that substantial growth may have occurred over the period when the firm changes its status from pre-interlisting to currently interlisting.

TABLE 6.2
AVERAGE SALES
(Dollar figures in millions)

	PRE	CURRENT	MATURE	NON
PRE	$461.35		*	
CURRENT		$904.46		
MATURE	*		$1130.22	*
NON			*	$591.78

Significance: (*) significant at .05

Table 6.3 tends to support this proposition. There are large variations in the average growth in earnings per share across all categories, with the exception of the currently interlisting and mature interlisted categories. However, in all mean comparisons, the observed differences are not statistically significant. Nevertheless, the rapid average growth rate observed for firms in the pre-interlisting stage may be indicative of a small firm effect coming into play around the time the firm interlists which in turn could be consistent with abnormal returns such as may be detected.

TABLE 6.3
AVERAGE GROWTH OF EARNINGS PER SHARE

	PRE	CURRENT	MATURE	NON
PRE	93.540%			
CURRENT		24.850%		
MATURE			23.510%	
NON				-14.620%

When average profitability, as measured by average return on investment is examined, a pattern consistent with the life cycle hypothesis emerges, as can be seen in Table 6.4.

TABLE 6.4
AVERAGE ROI

	PRE	CURRENT	MATURE	NON
PRE	14.400%			
CURRENT		15.660%		
MATURE			13.339%	
NON				14.910%

Average ROI first increases to peak at the currently interlisting phase, and then declines as the firm becomes entrenched on the foreign exchange. Furthermore, the average ROI for currently interlisting firms is significantly greater than that of the mature and non-interlisted firms. This result lends support to the life cycle argument that firms tend to interlist at a robust point in their evolution after which limited stagnation may set in. As discussed elsewhere, reduced profitability during the mature stage is also consistent with the chronological life cycle theory of the firm since these firms are older not only from an interlisting perspective, but also in a strict chronological sense. In summary, it should be noted that the peak performance in terms of average ROI exhibited in the currently interlisting phase could aid in explaining share price enhancement such as is observed at the point of interlisting. As was the case when comparing growth in earnings per share, however, observed differences between average values of ROI are not statistically significant.

As concerns average risk, which is shown in Table 6.5, support is once again found for the use of an evolutionary perspective in explaining the process of interlisting. It can be seen that although all

categories of interlisted firms display lower average risk than non-interlisted firms, within the interlisting categories, average risk first rises and then declines as the firm move through the interlisting life cycle. For interlisted firms risk is greatest at the point of interlisting, which once again reenforces the hypothesis that abnormal returns around the interlisting date may be explained by the underlying economic behavior of the firm. It should be noted, however, that differences in average risk are again not significant.

<u>TABLE 6.5</u>
<u>AVERAGE RISK</u>

	<u>PRE</u>	<u>CURRENT</u>	<u>MATURE</u>	<u>NON</u>
PRE	8.600%			
CURRENT		15.450%		
MATURE			10.970%	
NON				24.100%

An additional element which may directly impinge upon the pricing of the firm's shares is their liquidity on the stock exchange. Again, a pattern consistent with that predicted emerges. In Table 6.6 it can be seen that average liquidity rises, to peak at the currently interlisting stage and then declines once mature interlisted status is attained. As before, simple comparisons of means again does not appear to yield statistically significant results.

TABLE 6.6
AVERAGE LIQUIDITY

	PRE	CURRENT	MATURE	NON
PRE	13.700%			
CURRENT		25.310%		
MATURE			18.940%	
NON				15.160%

It has been argued throughout this dissertation, that at least part of the motivation to internationally interlist derives from the inability of some firms to meet their capital requirements within the geographic confines of the Canadian capital market. The pattern which emerges in Table 6.7 conforms to this supposition.

TABLE 6.7
AVERAGE CAPITAL EXPENDITURE

	PRE	CURRENT	MATURE	NON
PRE	$46.92		*	
CURRENT		$36.50		
MATURE	*		$149.00	*
NON			*	$52.03

Significance: (*) significant at .05

In part, since firms are also increasing in average size as the interlisting life cycle progresses, a size effect is also captured by the capital expenditure statistics. While deflating the capital expenditure variable by sales, for example, would have eliminated this, it is total capital expenditure requirements of the firm, and not the per dollar of size capital expenditure requirement, that would require a firm to seek additional financing external to the Canadian capital

market. It is also of interest to observe in Table 6.7 that average capital expenditure is significantly greater in the mature interlisted category when compared to the pre-interlisting category, as well as when compared to the non-interlisted stage. As discussed in Chapter Four, the apparent upward trend in capital expenditure as the firm moves through the interlisting life cycle may provide an additional explanation of such share price enhancement as is found when interlisting occurs, since the market appears to react favorably to announcements of increased capital expenditure.

In regard to the dividend payout behavior of the interlisted firm, a pattern consistent with that predicted emerges as seen in Table 6.8. Greatest average dividend payout is exhibited by firms in the mature interlisted stage. The much lower average dividend payouts of firms in the pre-interlisting stage and the currently interlisting stage is consistent with the hypothesized capital expenditure requirements of firms during these stages of the evolutionary process. Also, the increasing trend in dividend payout as the firm moves through the interlisting life cycle is consistent with Mueller's (op.cit.) chronological life cycle theory of the firm.

TABLE 6.8
AVERAGE DIVIDEND PAYOUT

	PRE	CURRENT	MATURE	NON
PRE	10.820%			
CURRENT		16.430%		
MATURE			56.560%	
NON				45.010%

Finally, in regard to the debt financing policies of the firm it was suggested that during the pre-interlisting stage firms may make more extensive use of long-term debt financing relative to other stages in the interlisting life cycle, since they are not yet permitted access to the deeper U.S. equity market. Table 6.9 provides weak support for this argument insofar as only during the pre-interlisting phase are positive average annual changes in long-term debt observed. However, the differences in average changes in long-term debt are never significant between groups.

TABLE 6.9
AVERAGE GROWTH IN LONG-TERM DEBT

	PRE	CURRENT	MATURE	NON
PRE	5.660%			
CURRENT		-6.220%		
MATURE			-7.670%	
NON				-0.480%

To conclude, the descriptive statistics which were provided tend, for the most part, to lend encouraging support to the evolutionary perspective which was developed in Chapter Four to explain the process of international interlisting. Moreover, much of the evidence amassed thus far points to the conclusion that abnormal returns which might be detected by the conduct of a traditional event study may be entirely compatible with capital market efficiency once the underlying economic performance of firms during the transition from the pre-interlisting to currently interlisting phases is taken into account. Conversely, failure

to provide evidence of abnormal returns, given the observed differences, might well be construed as evidence of market inefficiency.

We now turn to the results of the multinomial logit analysis. Although attention remains focused upon the economic performance of the firm as it evolves throughout the interlisting process, the emphasis has shifted to the investigation of key variables that aid in predicting the probability that a firm will fall within one of the previously defined interlisting classes versus the probability that the firm will possess non-interlisted status.

The results in Table 6.10 which follows refer to pooled cross-sections ending in 1980. It can be seen from this table that the model is highly significant as measured by the likelihood ratio test statistic which has a Chi square distribution with twenty-one degrees of freedom. The estimated coefficients refer to the logarithm of the odds of a given interlisting class over the base category assumed to be the non-interlisted group. Note that, frequently, for a given variable, all estimated coefficients are asymptotically significant. However, since probabilities must sum to one, even if one coefficient for a given variable differs significantly from zero, then all probabilities will be affected. For example, in Table 6.10, the coefficient on growth in EPS is significant only in the pre-interlisting category. This means that an increase in the growth of earnings per share will significantly enhance the log odds that a firm is pre-interlisting versus being non-interlisted. Consequently, all probabilities will shift as more weight is assigned to the pre-interlisting class.

TABLE 6.10
ESTIMATED PARAMETERS OF THE ML MODEL
CROSS-SECTIONAL POOLING ENDING 1980

	PRE/NON	CURRENT/NON	MATURE/NON
INTERCEPT	-0.616[1]	-2.495*	0.705*
ROI	1.803	3.133	-4.666*
CAPITAL EXP.	-0.005[1]	0.001	0.006*
RISK	-3.835[1]	-1.009	-0.820[1]
LIQUIDITY	-0.817	2.829*	1.871*
DIVIDEND PAYOUT	-0.766[4]	-0.691[3]	-0.053
GROWTH OF EPS	0.184[3]	0.126	0.090
GROWTH OF LONG-TERM DEBT	0.050	-0.037	-0.067

Log of Likelihood Function — -496.170
Likelihood Ratio Test — 98.842**
(21 degrees of Freedom)
**Significant: Critical Chi Square at .005 — 41.401

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

Since the log odds render straightforward interpretation somewhat cumbersome, they have been unscrambled, a procedure also adopted by Perloff and Wachter (1979). The probabilities are evaluated at the mean values of the variables for the entire sample of pooled cross-sections up to the end of 1980. The impact of a change in each variable is then calculated assuming all other variables remain unchanged. The results obtained by unscrambling the log odds are summarized in Tables 6.11 and 6.11A. From Table 6.11 it can be seen that an increase in ROI substantially increases the probability that the firm is currently interlisting or pre-interlisted, and to a lesser extent non-interlisted, while the reverse effect is uncovered for mature

interlisted firms. Doubling ROI causes the probability that the firm is currently interlisting to move from 4.05% to 8.66%, a change of over 113% as indicated in Table 6.11A. A similarly strongly positive influence is found for the pre-interlisted category. In contrast, increases in ROI reduce the probability that the firm is at the mature interlisted stage of evolution by more than 28%. These results confirm, again, the usefulness of the evolutionary perspective in assessing the consequences of international interlisting. The positive relationship between ROI and the probability of being currently interlisting and pre-interlisting supports the earlier contention in this dissertation that abnormal returns surrounding the international interlisting date can be explained by the underlying economic performance of the firm.

Risk is positively related to the probability that the firm is non-interlisted. Among the interlisting classes it can be seen that the risk of the firm increases as it moves through the interlisting life cycle. Increasing risk reduces the probability that the firm is pre-interlisting by 36.98%, while the probability of being currently interlisting is reduced by only 4.69% and the probability of having interlisted in the past is reduced by merely 1.87%. Once again, abnormal returns "due to interlisting" could simply be reflecting the heightened total risk of the firm during the currently interlisting phase of its evolution. Their persistence once the event has occurred, moreover, should be examined in light of the heightened risk profile of the firm in the mature phase of the interlisting life cycle.

A doubling of liquidity impacts upon the probability that the

TABLE 6.11
PROBABILITIES OF INTERLISTING CLASSES
(In percent)

CATEGORY	AVERAGE	DOUBLE ROI	DOUBLE CAP EXP.	DOUBLE LIQ.
PRE	4.11	7.31	1.65	2.79
CURRENT	4.05	8.66	2.92	5.24
MATURE	64.71	46.54	77.73	70.69
NON	27.14	37.49	17.69	21.28

CATEGORY	DOUBLE RISK	DOUBLE GROWTH OF EPS	DOUBLE DIV. PAYOUT	DOUBLE GROWTH OF DEBT
PRE	2.59	4.20	2.98	4.15
CURRENT	3.86	4.09	3.04	4.05
MATURE	63.50	64.93	65.73	64.57
NON	30.05	26.78	28.26	27.24

Average Values Used (Dollar figures in millions):
ROI - 13.99%, Capital Expenditure - $107.23, Liquidity - 17.73%,
Risk - 14.73%, Growth of EPS - 18.65%, Dividend Payout - 47.40%,
Growth of Debt - -4.41%

TABLE 6.11A
PERCENTAGE CHANGE IN PROBABILITIES OF INTERLISTING CLASSES

CATEGORY	DOUBLE ROI	DOUBLE CAPITAL EXP.	DOUBLE LIQUIDITY	DOUBLE RISK
PRE	77.86	-59.85	-32.12	-36.98
CURRENT	113.83	-27.90	29.38	-4.69
MATURE	-28.08	20.12	9.24	-1.87
NON	38.13	-34.82	-21.59	10.72

CATEGORY	DOUBLE GROWTH OF EPS	DOUBLE DIV. PAYOUT	DOUBLE GROWTH OF DEBT
PRE	2.19	-27.49	0.97
CURRENT	0.99	-24.94	0.00
MATURE	0.34	1.58	-0.21
NON	-1.33	4.13	0.37

firm is currently interlisting, moving it from 4.04% to 5.24% which is a change of almost thirty percent. Doubling liquidity generates increases in the probability that the firm has interlisted in the past as well, although the effect is less pronounced. This result conforms to the hypothesis that following initial interest in the firm during the currently interlisting stage, interest flags somewhat thereafter. Conversely, the probability that the firm is either non-interlisted or pre-interlisting is negatively related to liquidity. Doubling liquidity reduces the probability that the firm will interlist in the future by slightly more than 32%, while a reduction of nearly 22% is evidenced for the non-interlisted firm. Since both these categories represent firms which do not have access through interlisting to the deeper U.S. markets, the evidence provided here regarding liquidity supports Taylor's (1986) findings and further adds credence to the argument that improved liquidity may be an objective of firms which internationally interlist in the U.S.

Doubling dividend payout impacts negatively upon the probability that the firm is either in the pre-interlisting category or the mature interlisted category with the effect slightly more pronounced in the case of the former, as might be expected. To the extent that the interlisting decision is motivated by the desire to obtain capital to fuel capital expansion plans, firms on the threshold of interlisting may be filling the shortfall of the Canadian capital market through financing with retained earnings. The evidence provided in Tables 6.10, 6.11, and 6.11A, tend not to support the contentions made by Booth and Johnston (op.cit.), that the dividend policy of interlisted firms

mirrors one conforming to U.S. practices. While doubling dividend payout does increase the probability that the firm has interlisted in the past, the change is inconsequential at 1.58%. Indeed, doubling dividends appears to enhance the probability that the firm is non-interlisted, to a somewhat greater degree. It should be pointed out, however, that the evidence provided by Booth and Johnston regarding the dividend policy behavior of interlisted firms is itself weak.[43] Before leaving the subject of dividend payout, one final note should be added regarding the pattern of payout within the interlisting life cycle. The evidence provided here indicates that dividend payout increases as the cycle progresses. To the extent that share prices react favorably to announcements of increases in dividends, one might anticipate increases in returns following the interlisting event as a consequence.

As regards the relationship between capital expenditure and the probabilities of the various categories of TSE firms, a fairly strong effect is uncovered. When capital expenditure is doubled, the probability that the firm is mature interlisted moves from 64.71% to 77.73%, a change of over 20%. Doubling capital expenditure substantially reduces the probability that the firm falls in any of the other categories. For example, the probability that the firm is pre-interlisting declines to 1.6% from the initial calculated value of 4.1%, representing a fall of almost 60%. The probability that the firm is at the currently interlisting stage of its development falls by less than 28% when capital expenditure is double. This evidence indicates

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[43]In Chapter Four the controversy surrounding the dividend clientele effect was briefly discussed. It is not clear whether increased payout is typical of U.S. firm behavior.

that firms which have internationally interlisted pursue more vigorous new investment strategies than those firms which are exclusively listed on the TSE, and are categorized as either non-interlisted or pre-interlisting. Moreover, firms do not appear to substantially increase their levels of capital expenditure until they are entrenched on the foreign exchange, or in other words until that have attained mature interlisted status. These findings tend to support the contention that international interlisting is motivated by the firm's need to fulfil the financing of its capital expenditures outside the geographic confines of the Canadian capital market and are congruent with the dividend policy evidence presented previously in this chapter. As discussed in Chapter Four, to the extent that increases in capital expenditure are evaluated favorably in the market place, price increases in the firm's equity following interlisting should be carefully evaluated within the context of the capital expenditure profile of the firm.

In Chapter Four arguments were put forth which suggested that rapid growth would accompany the early stage of the interlisting life cycle. In turn, such growth would help account for the empirically supported propositions relating to the dividend policy and capital expenditure habits of firms when viewed within an evolutionary context. As seen in Tables 6.10 through 6.11A, the influence of annual changes in EPS in shifting the weight among listing categories is not strong. Nevertheless, Table 6.10 does reveal that the coefficient on growth in EPS is significant for the pre-interlisting class. From Table 6.11A it can be seen that doubling the percentage change in EPS increases the

probability that the firm is in the pre-interlisting stage by slightly more than 2%. Altogether, however, Table 6.11A reveals a very weak influence on the part of the EPS variable. The pattern predicted for EPS is empirically supported in that the growth rate of EPS declines as the cycle progresses, but such support is weak. Thus the small firm effect, whose potential role was discussed in Chapter Four, appears to play only a minor role in the interlisting life cycle.

6.5 SUMMARY

This concludes the discussion of the differences in economic performance among firms with differing interlisting status. With the exception of the non-effect of long-term debt changes, the empirical results obtained lend strong support to the interlisting life cycle hypothesis developed in Chapter Four. Moreover, the results bear importantly upon tests of market efficiency in regard to the interlisting event. The total risk of the firm appears to increase as the firm moves through the interlisting life cycle and to the extent this phenomenon is reflected in systematic risk, risk adjusted returns may not be extraordinary. Apart from risk, a variety of other economic factors, including profitability, capital expenditure, dividend payout, liquidity, and growth in earnings per share were seen to vary in a predictable pattern as the firm evolved through the three interlisting stages. Indeed, the use of an evolutionary perspective itself premises the dynamic nature of firm behavior. Consequently, any study of the market reaction to the interlisting event should necessarily take account of underlying changes in the behavior of the firm which in turn

might be useful in explaining abnormal returns such as are detected. The market reaction to the event of international interlisting is the subject of Chapter Seven which follows.

CHAPTER SEVEN
THE MARKET RESPONSE TO THE INTERLISTING EVENT

7.1 INTRODUCTION

This chapter contains an investigation of the market response to the event of international interlisting. In particular, using daily stock return data, a conventional event study is first carried out and evidence of market inefficiency with respect to the interlisting event is obtained. Secondly, attention is focused upon possible changes in systematic risk which may occur coincident with interlisting and which would therefore cast doubt upon the conclusions drawn from a conventional event study. Consequently, an alternative methodology, that of intervention analysis, is employed which potentially is more robust in assessing the market response to the interlisting event given hypothesized changes in systematic risk and the statistical properties of daily returns. Finally, the technique of switching regressions is implemented as a means of assessing the longer term impact of international interlisting upon the systematic risk of the firm. Unlike the two previous methods used to investigate the market response to the interlisting event, the switching regressions use monthly data over a seventy-two month period surrounding the interlisting event. The use of monthly data permits an examination of the interlisting impact, such as exists, over a period longer than the one year used in the event study and intervention analysis approaches. The desirability of using this longer holding period are further elaborated upon in Section 7.4 wherein the switching technique is discussed more fully.

SECTION 7.2 THE CONVENTIONAL EVENT STUDY APPROACH

The investigation of the market response to the event of international interlisting necessarily revolves about the detection of abnormal returns whose existence may suggest market inefficiency in a semi-strong form. The discussion that follows addresses two key issues in the proper conduct of event studies. Specifically, how should abnormal returns be measured and over what period of time? Turning first to the latter issue, it would seem reasonable to argue that at least weekly, if not daily returns are the appropriate intervals to consider when attempting to assess the market's response to the event of international interlisting. Longer holding periods, of one month for example, while reducing certain problems inherent in the use of daily data, may potentially obscure the issue at hand of market efficiency. Nevertheless, it is germane to the present study to evaluate the potential difficulties associated with the use of daily data. Daily stock returns appear not to be normally distributed.[44] Nevertheless, Brown and Warner (1985) provide evidence to the effect that:

> The non-normality of daily returns has no obvious impact on event study methodologies. Although daily excess returns are highly non-normal, there is evidence that the mean excess return in a cross-section of securities converges to normality as the number of sample securities increases.[45]

However, conventional approaches to the detection of abnormal returns which employ one of three possible definitions of abnormal returns: mean-adjusted, market adjusted, or market and risk adjusted,

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[44]See Fama (1976), and Brown and Warner (1985).

[45]S. Brown and J. Warner, "Using Daily Stock Returns: The Case of Event Studies," Journal of Financial Economics 14 (March 1985) : 30.

are inappropriate if analysis is desired to be carried out on a firm by firm basis rather than a portfolio basis.[46]

Another difficulty in using daily data as pointed out by Brown and Warner (op.cit.) derives from non-synchronous trading that will yield downward biased estimates of systematic risk when the market model approach is employed to investigate the existence of abnormal returns. The authors provide evidence to the effect that thin trading is not in reality as serious a problem as might have been expected. They uncover no advantage to using adjustment procedures for thin trading effects but rather provide evidence to the effect that ordinary least squares (OLS) estimation yields adequate estimates of abnormal returns even though biased estimates of beta are employed.[47]

As mentioned in the opening paragraphs of this section, there are essentially two qualitative judgments open to the discretion of the researcher as regards the conduct of an event study. The appropriate

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[46]Brown and Warner (1985) provide succinct descriptions of each approach to the detection of abnormal returns. In the mean adjusted returns model, the average return on a security over time is calculated and the abnormal return is then defined as the deviation from the mean at a given point in time. Implicit in the use of this approach is the hypothesis that no change in the systematic risk of the securities has occurred coincident with the event of interest. The market adjusted returns model involves the comparison of the security return on the market portfolio of assets. In this case the stronger assumption that the security possesses the same level of systematic risk as the market portfolio is required. The market and risk adjusted returns method of identifying abnormal returns assesses the abnormal return on a security as the residual obtained in regressing a security return against the return on the market portfolio. This market model approach to the detection of abnormal returns does not admit the possibility of time varying risk premia, and also presumes that the pricing mechanism for the security remains the same, before and after the event has occurred.

[47]See Brown and Warner (1985), pages 16 to 20 for a complete discussion of their results pertaining to thin trading.

holding period to consider and the attendant consequences from an econometric perspective have been discussed above. What remains to address is the manner in which abnormal returns are to be identified. Mention was briefly made of the three methods typically employed in the conduct of event studies in detecting abnormal returns. Brown and Warner (1980), in an analysis of event studies using monthly data find that the simple mean adjusted returns model is an adequate procedure to employ in the assessment of abnormal returns and thus no advantage is earned in using the more sophisticated methods of calculating abnormal returns. In their parallel study employing daily stock return data the authors conclude that:

> As in the case of monthly data, the conclusion that the methodologies are well-specified applies to excess returns measured in a variety of ways, including market adjusted returns and the OLS market model. With daily data these two methodologies have similar power and, as expected, the power of each is much greater with daily than with monthly data. Market Adjusted Returns and the OLS market model also outperform a simpler procedure: Mean Adjusted Returns has low power in cases involving event-date clustering.[48]

Nevertheless, a serious drawback associated with all three "conventional" methods of detecting abnormal returns lies in the fact that none of the methods allows for changes in systematic risk which may be concurrent with the event of international interlisting.

There is reason to believe that changes in systematic risk may accompany international interlisting. Turnbull (1977) develops an asset pricing model wherein beta is shown to be a non-linear function of earnings growth. Thus, as growth in earnings per share declines, beta may rise. Since firms are hypothesized to interlist at their peak

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[48] S. Brown and J. Warner, "Using Daily Stock Returns: The Case of Event Studies," Journal of Financial Economics 14 (March 1985) : 30.

performance stage, a period which follows the rapid growth of the pre-interlisting stage, a rise in beta around the interlisting date may occur. Several studies have also noted that events of consequence appear to be accompanied by greater returns volatility. Kalay and Lowenstein (1985) in their examination of dividend announcements find that beta during the event period exceeds the level observed during the non-event period. Thus they argue that traditionally measured positive excess returns do not necessarily imply economic profit, but rather reflect the higher compensation that risk averse investors require to hold the asset over a riskier period. The risk pattern which is anticipated is one of increasing, then declining risk. Risk is anticipated to fall sometime after the event of international interlisting in concert with the hypothesized lessened volatility of the firm's cash flows once the mature interlisted phase is entered into. Such a finding would lend empirical support to the interlisting life cycle hypothesis.

Finally, it may be the case, as suggested by Booth and Johnston (1984), that interlisted firms are priced in the U.S. rather than in Canada. No direct test of the market segmentation hypothesis will be carried out due to the ambiguity in results produced by the available technologies, as was discussed in Chapter Three.

It is noteworthy that to date only one test of the market response to the interlisting event has been carried out. Switzer (1986) uses the mean adjusted returns approach on daily stock returns for twenty-one interlisted firms and finds evidence of abnormal returns. The observation period consisted of the one hundred and twenty days surrounding the interlisting event and all returns were obtained from

quoted prices on the Toronto Stock Exchange. The event study conducted in this dissertation also uses daily stock returns for a sample of eighteen interlisted firms.[49] Prior to the interlisting event returns are calculated from quoted prices on the Toronto Stock Exchange since U.S. data are obviously unavailable. However, following interlisting, returns are calculated from quoted prices on the U.S. exchanges and translated to Canadian returns at the daily exchange rate. Moreover, the conventional event study conducted here employs the market model approach to the detection of residuals and uses the return to the NYSE index translated at the daily exchange rate as a proxy for the market portfolio. The use of U.S. returns rather than Canadian returns was in part determined by the fact that U.S. daily data was more readily available than the Canadian counterpart. Furthermore, it is possible that the thin trading bias may be attenuated when U.S. rather than Canadian returns are used.

Market model residuals were obtained by first regressing individual security returns on the market proxy for a period designated as lying outside the event period. The estimation period was defined to be from minus one hundred and fifty days to minus one hundred and one days relative to the interlisting date. The regression used is given by:

$$(7.1) \quad R_{it} = \alpha_i + \beta_i R_{mt} + u_i$$

where:

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[49] A smaller sample is used in this study because three of the firms employed by Switzer (1986) had other firm specific events coincident to interlisting, (eg. mergers), or represented an interlisting switch from AMEX to the NYSE.

R_{it} — the daily return on security i at time t, for t — minus one hundred and one days to minus one hundred and fifty days

α_i, β_i — parameters of the regression model to be estimated

R_{mt} — the return on the NYSE index translated into Canadian dollars at the daily exchange rate.

Using the estimated parameters from equation (7.1) the abnormal return during the event period defined to be plus or minus one hundred days surrounding the event was calculated as follows:

$$(7.2) \quad e_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), \quad t = -100 \text{ days to } +100 \text{ days}$$

The approach makes the assumption that the expected value of e_{it} is zero and thus any non-zero value is interpreted as an excess return. Furthermore, the residuals are assumed to be cross-sectionally independent. Residuals are calculated in this manner for each of the eighteen firms and then the average daily residual is calculated. That is:

$$(7.3) \quad AR_t = 1/18 \left(\sum_{i=1}^{18} e_{it} \right)$$

The t-test is used to assess the statistical significance of the average residuals calculated in equation (7.3). Since the excess returns may exhibit cross-sectional correlation which could bias the t-test, the crude dependence adjustment was used in calculating standard deviation. Specifically the test statistic is obtained by dividing AR_t by the average standard deviation in the estimation period of all securities.[50]

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[50] The average residuals for all firms during the estimation period is first calculated and it is the standard deviation of the cross-sectionally averaged residuals that is employed in the t-test.

In addition to examining the average residuals, the cumulative average residual, (CAR), during the event period is also computed. This involves successively summing the average residuals over the entire event period and thus permits an estimate of the excess return over holding periods of longer than one day. The t-test is again used to assess the statistical significance of the cumulative average residuals.

Tabulated and graphical representation of the conventional event study analysis are found at the end of this section. Table 7.1 presents the results obtained for the entire sample of interlisted firms. The evidence provided by a study of the average residuals indicates, as anticipated, that international interlisting may be construed as generating inefficient market responses when changes in risk are not considered, as is the case here. Significantly positive abnormal residuals are shown to occur ninety days prior to the actual interlisting date as well as eighteen and twenty-seven days following actual interlisting. It is quite likely, moreover that the positive abnormal return long before the interlisting event may correspond with the announcement of intention to interlist. Strongly positive and for the most part statistically significant, cumulative average residuals during the event period are also shown to occur as seen in Table 7.1. It is noteworthy that the cumulative average residuals lose their significance in the period immediately surrounding the interlisting date. From day minus thirty-eight until day plus seventeen the CARS are generally not significant. However, a resumption of the positive significant trend in the CARS detected prior to the interlisting event can be seen thereafter stretching almost until the end of the

observation period. This evidence differs slightly from that obtained by Switzer. (op.cit.). For instance, he finds that the cumulative average residuals are persistently negative until just prior to the interlisting date and then become positive.

In order to determine whether or not the host exchange exerted an influence upon the findings of the conventional event study carried out here, the sample of interlisted firms was divided in two according to the stock exchange on which interlisting occurred. Coincidentally, the eighteen firms were evenly divided between AMEX-interlisted and NYSE-interlisted. The results obtained are shown in Tables 7.2 and 7.3. Evidence of significant average residuals was detected for both the AMEX sample and the NYSE sample. The NYSE sample has a greater number of significant (and always positive) average residuals. The first significant average residual occurs at day minus ninety-one which again suggests that the market may have responded to the announcement of intention to internationally interlist. Significant positive average residuals also occur at day minus fifty-six, as well as day plus nine, day plus forty-six and day plus fifty-seven. As concerns the AMEX sample of interlisted firms, significant average residuals occur only twice at day minus ninety-two, perhaps corresponding to the announcement date, and day plus eighteen, shortly following the interlisting event itself. Examination of the cumulative average residuals in the two samples would seem to indicate that a slight difference exists as regards market response to international interlisting. For NYSE-interlisted firms negative values of the CARS are never statistically significant. Indeed, over the entire event period under consideration, the CAR is almost

always positive and significant. When the cumulative average residuals from the AMEX sample are studied, it can be seen that in the period of day minus thirty-two to day minus nineteen, the CAR is often negative and significant. Like the NYSE sample, however, the AMEX sample is dominated by positive and statistically significant cumulative average residuals. It is nevertheless noteworthy to draw one final comparison between the two samples and this is in the area of the magnitude of the CARS. During the period following interlisting, particularly that encompassing day plus thirty-eight to day plus fifty-eight, the cumulative average residuals in the AMEX sample are much larger than any that occurred in the NYSE sample. An alternative method of assessing the statistical significance of the average residuals surrounding the interlisting date was also employed. In an event study of this sort, testing whether the vector of abnormal returns is zero may be more powerful than applying the t-test to individual abnormal returns. The appropriate test statistic is the Hotelling T^2 statistic which has an F distribution with $(n-p)$ degrees of freedom, where n represents the number of firms in the sample and p, the number of observations. Due to the fact that the Hotelling T^2 statistic is not defined in the circumstance where the number of observations exceeds the number of firms, the test of whether or not the vector of excess returns is zero is restricted to the period immediately surrounding the interlisting event. That is, for the entire sample of eighteen firms, the vector of abnormal returns encompassing the period plus or minus eight days relative to the event date was tested to determine if it was statistically significant from zero. The value of the Hotelling T^2

statistic was 185.5068 with a corresponding calculated $F(17,1)$ of 0.6419 which is not significant. The vectors of abnormal returns for the AMEX and NYSE samples were also examined for statistical significance in the period plus/minus three days surrounding the interlisting event. For the AMEX sample the Hotelling T^2 was calculated at 42.3410 with a corresponding $F(7,2)$ value of 1.5122 which again is not significant. For the NYSE sample the Hotelling T^2 equalled 23.5732 with a calculated $F(7,2)$ value of 0.8419 which is not significant. Thus based on these results no significant abnormal returns immediately surrounded the interlisting date. If the announcement date was known precisely, however, there is reason to believe that significant values of the Hotelling T^2 statistic might prevail, given that the average residuals for the whole sample, and the two sub-samples, were statistically significant very early in the observation period at a point which may correspond closely with the announcement to interlist.

The evidence of market inefficiency uncovered by the conventional event study needs to be carefully evaluated in light of the possibility of changing risk profiles during the interlisting period. The evidence obtained from both the descriptive statistics as well as the multinomial logit analysis, strongly suggests that the risk of the firm will rise when it is about to interlist or has just interlisted. To the extent that increases in risk, such as occur, are translated to heightened systematic risk, the abnormal returns may simply be reflecting the higher return demanded by investors for holding the security over a riskier period in its evolution. Moreover, as observed by Kalay and Lowenstein (op.cit.), events of consequences appear to be

associated with increases in systematic risk. In summary, because the conventional event study approach to the detection of abnormal returns fails to consider changing risk and the possibility of autocorrelated residuals, an alternative method to investigate the market response to the event of international interlisting would seem to be desirable. To this end, intervention analysis is employed.

Table 7.1
AVERAGE RESIDUALS & CUMULATIVE AVERAGE RESIDUALS
(WHOLE SAMPLE)

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
-100	.7038632E-03	.9797131E-01	.7038632E-03	0.9797131E-01
-99	.6789147E-02	.9449871	.7493010E-02	1.042958
-98	.9352197E-02	1.3017400	.1684521E-01	2.3446994
-97	.3886295E-02	.5409367	.2073150E-01	2.885635*
-96	.9144746E-03	.1272865	.2164598E-01	3.012922*
-95	.3999566E-02	.5567029	.2564554E-01	3.569625*
-94	-.4974583E-02	-.6924164	.2067096E-01	2.877208*
-93	.6104743E-02	.8497243	.2677570E-01	3.726933*
-92	.1521057E-01	2.1171720	.4198627E-01	5.844104*
-91	.9819756E-02	1.3668200	.5180603E-01	7.210924*
-90	.1815186E-01	2.5265730⁴	.6995789E-01	9.737497*
-89	-.9690481E-03	-.1348826	.6898884E-01	9.602614*
-88	.1030381E-01	1.4341960	.7929265E-01	11.03681*
-87	-.1331881E-01	-1.8538560	.6597384E-01	9.18295*
-86	.1416333E-01	1.9714060	.8013718E-01	11.15436*
-85	-.3204483E-02	-.4460347	.7693269E-01	10.70833*
-84	.5411519E-02	.7532339	.8234421E-01	11.46156*
-83	.2851215E-02	.3968630	.8519543E-01	11.85842*
-82	-.3018589E-02	-.4201599	.8217684E-01	11.43826*
-81	-.7857553E-03	-.1093699	.8139108E-01	11.32889*
-80	-.2001115E-02	-.2785369	.7938997E-01	11.05036*
-79	-.2506798E-02	-.3489233	.7688317E-01	10.70143*
-78	-.3190958E-02	-.4441521	.7369221E-01	10.25728*
-77	-.5214831E-02	-.7258566	.6847738E-01	9.531424*
-76	.4832275E-02	.6726084	.7330966E-01	10.20403*
-75	-.7857755E-02	-1.0937270	.6545190E-01	9.110305*
-74	-.8042247E-02	-1.1194070	.5740966E-01	7.990898*
-73	.7167629E-02	.9976683	.6457728E-01	8.988566*
-72	.1036508E-02	.1442725	.6561379E-01	9.132839*
-71	-.1535814E-03	-.2137712E-01	.6546021E-01	9.111462*
-70	-.8411008E-03	-.1170735	.6461911E-01	8.994388*
-69	-.1033756E-01	-1.4388940	.5428155E-01	7.555494*
-68	.6339137E-02	.8823498	.6062068E-01	8.437844*
-67	-.3915956E-02	-.5450653	.5670473E-01	7.892779*
-66	.5911991E-02	.8228950	.6261672E-01	8.715674*
-65	.2367559E-02	.3295426	.6498428E-01	9.045216*
-64	.5484854E-02	.7634414	.7046913E-01	9.808658*
-63	.1623452E-02	.2259696	.7209258E-01	10.03463*
-62	-.3073101E-02	-.4277475	.6901948E-01	9.606880*
-61	-.4866329E-02	-.6773484	.6415315E-01	8.929531*
-60	-.1374714E-02	-.1913476	.6277844E-01	8.738184*
-59	.1134758E-01	1.5794790	.7412602E-01	10.31766*
-58	-.3993152E-02	-.5558102	.7013287E-01	9.761852*
-57	-.5502002E-02	-.7658282	.6463086E-01	8.996024*
-56	.1334897E-02	.1858054	.6596576E-01	9.181829*

Table 7.1 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
-55	-.7153931E-02	-.9957617	.5881183E-01	8.186068*
-54	-.5438883E-02	-.7570427	.5337295E-01	7.429025*
-53	-.3327757E-03	-.4631933E-01	.5304017E-01	7.382706*
-52	-.6201464E-03	-.8631869E-01	.5242002E-01	7.296387*
-51	-.3553063E-02	-.4945538	.4886696E-01	6.801833*
-50	-.3236386E-02	-.4504753	.4563058E-01	6.351358*
-49	.9057130E-03	.1260670	.4653629E-01	6.477425*
-48	.1990246E-02	.2770241	.4852653E-01	6.754449*
-47	.7361502E-02	1.0246540	.5588804E-01	7.779103*
-46	-.9890670E-02	-1.3766910	.4599737E-01	6.402412*
-45	-.3866398E-02	-.5381672	.4213097E-01	5.864245*
-44	-.4726037E-03	-.6578210E-01	.4165836E-01	5.798463*
-43	-.4953162E-02	-.6894347	.3670520E-01	5.109028*
-42	.4042982E-02	.5627460	.4074818E-01	5.671774*
-41	-.8849636E-02	-1.2317880	.3189855E-01	4.439986*
-40	-.2157585E-02	-.3003161	.2974096E-01	4.139669*
-39	-.9502324E-02	-1.3226360	.2023864E-01	2.817033*
-38	-.8889490E-02	-1.2373360	.1134915E-01	1.579697
-37	.3542874E-02	.4931356	.1489202E-01	2.072833
-36	-.6462229E-02	-.8994830	.8429794E-02	1.173350
-35	-.4362515E-02	-.6072222	.4067279E-02	.5661279
-34	.9413924E-02	1.3103320	.1348120E-01	1.876460
-33	-.1163111E-01	-1.6189430	.1850097E-02	.2575166
-32	-.5337414E-02	-.7429192	-.3487317E-02	-.4854026
-31	-.5677360E-03	-.7902365E-01	-.4055053E-02	-.5644262
-30	.4673610E-02	.6505237	.6185571E-03	.8609749E-01
-29	-.3932203E-02	-.5473266	-.3313645E-02	-.4612291
-28	-.3138473E-02	-.4368467	-.6452119E-02	-.8980758
-27	-.7226491E-02	-1.0058610	-.1367861E-01	-1.903937
-26	-.3895019E-02	-.5421509	-.1757363E-01	-2.446088
-25	.5243711E-02	.7298765	-.1232992E-01	-1.716212
-24	.1443333E-02	.2008987	-.1088659E-01	-1.515313
-23	-.2928002E-02	-.4075510	-.1381459E-01	-1.922864
-22	.6548856E-02	.9115407	-.7265731E-02	-1.011323
-21	-.3926941E-02	-.5465942	-.1119267E-01	-1.557917
-20	.9510002E-02	1.3237050	-.1682670E-02	-.2342122
-19	-.4251661E-02	-.5917922	-.5934331E-02	-.8260045
-18	.6578057E-02	.9156052	.6437260E-03	.8960076E-01
-17	-.8143520E-02	-1.1335030	-.7499794E-02	-1.043903
-16	-.3437993E-02	-.4785372	-.1093779E-01	-1.522440
-15	.5779746E-02	.8044877	-.5158041E-02	-.7179521
-14	.2819693E-02	.3924754	-.2338349E-02	-.3254767
-13	-.2416765E-02	-.3363916	-.4755114E-02	-.6618683
-12	.6647151E-02	.9252225	.1892037E-02	.2633542
-11	.1224705E-01	1.7046770	.1413908E-01	1.968031
-10	.5016076E-02	.6981918	.1915516E-01	2.666223*
-9	.4938533E-03	.6873986E-01	.1964901E-01	2.734963*
-8	-.7731250E-02	-1.0761190	.1191776E-01	1.658843

Table 7.1 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
-7	-.1761685E-02	-.24521040	.1015608E-01	1.413633
-6	-.3029139E-02	-.4216284	.7126939E-02	.9920047
-5	.3409336E-02	.4745483	.1053628E-01	1.466553
-4	-.4307830E-02	-.5996105	.6228445E-02	.8669425
-3	-.3276483E-02	-.4560565	.2951962E-02	.4108860
-2	-.1705200E-02	-.2373482	.1246762E-02	.1735378
-1	.4130801E-02	.5749696	.5377563E-02	.7485075
0	.2137487E-02	.2975185	.7515049E-02	1.046026
1	.4267943E-02	.5940586	.1178299E-01	1.640085
2	-.3440898E-02	-.4789415	.8342095E-02	1.161143
3	.3293535E-02	.4584299	.1163563E-01	1.619573
4	-.9749265E-02	-1.3570080	.1886364E-02	.2625646
5	-.4950501E-02	-.6890643	-.3064136E-02	-.4264997
6	-.2148601E-02	-.2990656	-.5212737E-02	-.7255653
7	-.1146892E-02	-.1596369	-.6359630E-02	-.8852022
8	-.1780739E-02	-.2478626	-.8140369E-02	-1.133065
9	.8786113E-02	1.2229460	.6457437E-03	.8988161E-01
10	.1285543E-02	.1789358	.1931287E-02	.2688174
11	.1154799E-03	.1607375E-01	.2046767E-02	.2848912
12	-.5695729E-02	-.7927933	-.3648963E-02	-.5079022
13	.3331364E-02	.4636953	-.3175992E-03	-.4420690E-01
14	.9812303E-02	1.3657830	.9494703E-02	1.321576
15	.7038640E-02	.9797142	.1653334E-01	2.301290
16	-.6320798E-02	-.8797971	.1021255E-01	1.421493
17	.5357573E-02	.7457250	.1557012E-01	2.167218
18	.1802281E-01	2.5086100	.3359293E-01	4.675828*
19	-.2642412E-02	-.3677996	.3095052E-01	4.308028*
20	-.5241936E-02	-.7296294	.2570858E-01	3.578399*
21	.4419390E-02	.6151385	.3012797E-01	4.193538*
22	-.7143858E-02	-.9943596	.2298411E-01	3.199178*
23	.1532290E-02	.2132807	.2451640E-01	3.412459*
24	-.5360912E-02	-.7461899	.1915549E-01	2.666269*
25	-.3387692E-02	-.4715356	.1576780E-01	2.194733
26	-.3364250E-02	-.4682728	.1240355E-01	1.726460
27	.2214030E-01	3.0817270*	.3454385E-01	4.808187*
28	-.2564141E-02	-.3569050	.3197971E-01	4.451282*
29	.6756710E-04	.9404721E-02	.3204728E-01	4.460687*
30	-.1677807E-02	-.2335354	.3036947E-01	4.227152*
31	.3398091E-02	.4729831	.3376756E-01	4.700135*
32	.4779718E-02	.6652929	.3854728E-01	5.365428*
33	.4044922E-02	.5630161	.4259220E-01	5.928444*
34	-.2468460E-02	-.3435870	.4012374E-01	5.584857*
35	.1826079E-02	.2541734	.4194982E-01	5.839030*
36	.3301826E-02	.4595840	.4525164E-01	6.298614*
37	.1863619E-03	.2593987E-01	.4543801E-01	6.324554*
38	.6257541E-02	.8709924	.5169555E-01	7.195546*
39	.1109627E-02	.1544500	.5280517E-01	7.349996*
40	-.1574932E-03	-.2192161E-01	.5264768E-01	7.328075*

Table 7.1 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
41	.8637882E-02	1.2023140	.6128556E-01	8.530389*
42	-.1350719E-03	-.1880078E-01	.6115049E-01	8.511588*
43	-.8506407E-02	-1.1840140	.5264408E-01	7.327574*
44	-.6140875E-02	-.8547535	.4650321E-01	6.472820*
45	.4166674E-02	.5799628	.5066988E-01	7.052783*
46	.7042743E-02	.9802852	.5771262E-01	8.033068*
47	-.8808126E-02	-1.2260100	.4890450E-01	6.807058*
48	.1837813E-02	.2558067	.5074231E-01	7.062865*
49	-.6159083E-02	-.8572879	.4458323E-01	6.205577*
50	.8149762E-02	1.1343720	.5273299E-01	7.339949*
51	.7283283E-02	1.0137660	.6001627E-01	8.353715*
52	.4923130E-02	.6852545	.6493940E-01	9.038970*
53	.9438179E-03	.1313708	.6588322E-01	9.170341*
54	-.3228342E-03	-.4493556E-01	.6556039E-01	9.125405*
55	-.4560565E-02	-.6347889	.6099982E-01	8.490616*
56	-.4054832E-02	-.5643954	.5694499E-01	7.926221*
57	.1104090E-02	.1536792	.5804908E-01	8.079900*
58	-.1318748E-01	-1.8355760	.4486160E-01	6.244324*
59	.2522109E-02	.3510544	.4738371E-01	6.595378*
60	.6640758E-02	.9243326	.5402447E-01	7.519711*
61	-.9522527E-02	-1.3254480	.4450194E-01	6.194262*
62	.2785484E-02	.3877139	.4728742E-01	6.581976*
63	-.4523766E-02	-.6296668	.4276366E-01	5.952309*
64	-.3963038E-02	-.5516186	.3880062E-01	5.400691*
65	-.1485553E-02	-.2067754	.3731507E-01	5.193915*
66	.1230764E-02	.1713111	.3854583E-01	5.365226*
67	.1127546E-01	1.5694400	.4982129E-01	6.934667*
68	.4417830E-02	.6149215	.5423912E-01	7.549588*
69	.2599859E-02	.3618765	.5683898E-01	7.911465*
70	-.3852116E-02	-.5361793	.5298686E-01	7.375285*
71	-.4252579E-02	-.5919200	.4873428E-01	6.783365*
72	-.6479017E-02	-.9018198	.4225527E-01	5.881546*
73	.5209607E-02	.7251296	.4746487E-01	6.606675*
74	.7606418E-03	.1058744	.4822551E-01	6.712550*
75	.5303025E-02	.7381325	.5352854E-01	7.450682*
76	.8258629E-03	.1149526	.5435440E-01	7.565635*
77	.4467353E-02	.6218146	.5882176E-01	8.187449*
78	-.3232014E-02	-.4498667	.5558974E-01	7.737583*
79	-.7458758E-02	-1.0381910	.4813098E-01	6.699392*
80	.2749962E-02	.3827694	.5088094E-01	7.082161*
81	.5849725E-02	.8142281	.5673067E-01	7.896389*
82	-.7986628E-03	-.1111665	.5593201E-01	7.785223*
83	-.6474039E-02	-.9011269	.4945797E-01	6.884096*
84	.1774785E-03	.2470339E-01	.4963545E-01	6.908799*
85	.1960131E-02	.2728323	.5159558E-01	7.181632*
86	-.5667500E-02	-.7888641	.4592808E-01	6.392768*
87	.3394214E-02	.4724435	.4932229E-01	6.865211*
88	-.1149976E-01	-1.6006610	.3782253E-01	5.264550*

Table 7.1 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
89	-.1977755E-02	-.2752854	.3584478E-01	4.989265*
90	.3774921E-02	.5254344	.3961970E-01	5.514699*
91	-.1133472E-01	-1.5776890	.2828498E-01	3.937010*
92	.8902517E-02	1.2391490	.3718750E-01	5.176159*
93	-.5321680E-02	-.7407290	.3186582E-01	4.435430*
94	-.7287876E-02	-1.0144060	.2457794E-01	3.421024*
95	-.8748541E-02	-1.2177170	.1582940E-01	2.203308
96	-.3911218E-03	-.5444056E-01	.1543828E-01	2.148867
97	-.5896776E-02	-.8207772	.9541503E-02	1.328090
98	-.7571942E-02	-1.0539450	.1969561E-02	.2741448
99	.7203630E-02	1.0026790	.9173191E-02	1.276824
100	-.6479656E-03	-.9019088E-01	.8525225E-02	1.186633

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*Significant at .005
4Significant at .010

Table 7.2
AVERAGE RESIDUALS & CUMULATIVE AVERAGE RESIDUALS
(NYSE FIRMS)

DATE	AV. RESIDUAL	T-STAT	CAR	T-STAT
-100	-.3031333E-02	-.4734466	-.3031333E-02	-.4734466
-99	.1994889E-02	.3115703	-.1036444E-02	-.1618763
-98	.8507556E-02	1.3287460	.7471111E-02	1.166870
-97	.2618556E-02	.4089772	.1008967E-01	1.575847
-96	.1510489E-01	2.3591460[4]	.2519456E-01	3.934994*
-95	-.9404444E-02	-1.4688260	.1579011E-01	2.466167[4]
-94	.1083333E-03	.1691996E-01	.1589844E-01	2.483087[4]
-93	-.1021889E-02	-.1596030	.1487656E-01	2.323484
-92	-.2463556E-02	-.3847687	.1241300E-01	1.938715
-91	.1694911E-01	2.6471850*	.2936211E-01	4.585900*
-90	.6221778E-02	.9717439	.3558389E-01	5.557644*
-89	.6688000E-02	1.0445600	.4227189E-01	6.602205*
-88	.8978556E-02	1.4023090	.5125044E-01	8.004514*
-87	-.2990333E-02	-.4670431	.4826011E-01	7.537871*
-86	.6852778E-02	1.0702960	.5511289E-01	8.607767*
-85	-.7051222E-02	-1.1012900	.4806167E-01	7.506477*
-84	-.2770000E-03	-.4326305E-01	.4778467E-01	7.463214*
-83	.1117556E-02	.1745446	.4890222E-01	7.637758*
-82	-.5701111E-03	-.8904239E-01	.4833211E-01	7.548716*
-81	-.1715444E-02	-.2679255	.4661667E-01	7.280791*
-80	.2591889E-02	.4048123	.4920856E-01	7.685603*
-79	-.4025556E-03	-.6287285E-01	.4880600E-01	7.622730*
-78	-.6045778E-02	-.9442555	.4276022E-01	6.678475*
-77	-.1710889E-02	-.2672140	.4104933E-01	6.411261*
-76	.2055000E-02	.3209587	.4310433E-01	6.732219*
-75	.1119222E-02	.1748049	.4422356E-01	6.907024*
-74	-.6011111E-04	-.9388411E-02	.4416344E-01	6.897636*
-73	.1069022E-01	1.6696450	.5485367E-01	8.567280*
-72	-.7109222E-02	-1.1103690	.4774444E-01	7.456932*
-71	-.1110556E-02	-.1734513	.4663389E-01	7.283480*
-70	-.8759667E-02	-1.3681220	.3787422E-01	5.915358*
-69	-.3435444E-02	-.5365624	.3443878E-01	5.378796*
-68	.4271111E-02	.6670804	.3870989E-01	6.045876*
-67	-.6279444E-02	-.9807505	.3243044E-01	5.065126*
-66	-.4392222E-03	-.6859961E-01	.3199122E-01	4.996526*
-65	-.1142989E-01	-1.7851690	.2056133E-01	3.211357*
-64	.1164078E-01	1.8181070	.3220211E-01	5.029464*
-63	.5960000E-03	.9308583E-01	.3279811E-01	5.122549*
-62	-.3140333E-02	-.4904707	.2965778E-01	4.632079*
-61	.1041889E-02	.1627267	.3069967E-01	4.794805*
-60	.1374111E-02	.2146146	.3207378E-01	5.009420*
-59	-.1105556E-03	-.1726704E-01	.3196322E-01	4.992153*
-58	-.1561333E-02	-.2438557	.3040189E-01	4.748297*
-57	-.6296889E-02	-.9834751	.2410500E-01	3.764822*
-56	.1867644E-01	2.9169670*	.4278144E-01	6.681789*

Table 7.2 CONTINUED

DATE	AV. RESIDUAL	T-STAT	CAR	T-STAT
-55	-.9210222E-02	-1.4384920	.3357122E-01	5.243297*
-54	-.5085667E-02	-.7943012	.2848556E-01	4.448996*
-53	-.1269556E-02	-.1982846	.2721600E-01	4.250711*
-52	-.1747889E-02	-.2729928	.2546811E-01	3.977719*
-51	.2788556E-02	.4355285	.2825667E-01	4.413247*
-50	.1592556E-02	.2487321	.2984922E-01	4.661979*
-49	-.4354000E-02	-.6800264	.2549522E-01	3.981953*
-48	.6151556E-02	.9607763	.3164678E-01	4.942729*
-47	.1222033E-01	1.9086240	.4386711E-01	6.851353*
-46	-.7072333E-02	-1.1045870	.3679478E-01	5.746766*
-45	.3678556E-02	.5745326	.4047333E-01	6.321298*
-44	-.2180111E-02	-.3404991	.3829322E-01	5.980799*
-43	-.3561889E-02	-.5563111	.3473133E-01	5.424488*
-42	.9626889E-02	1.5035690	.4435822E-01	6.928057*
-41	-.8974778E-02	-1.4017190	.3538344E-01	5.526338*
-40	.5587000E-02	.8726016	.4097044E-01	6.398939*
-39	-.8186667E-02	-1.2786290	.3278378E-01	5.120311*
-38	-.6214111E-02	-.9705465	.2656967E-01	4.149764*
-37	.2380778E-02	.3718401	.2895044E-01	4.521604*
-36	.2699000E-02	.4215414	.3164944E-01	4.943146*
-35	-.2256222E-02	-.3523864	.2939322E-01	4.590759*
-34	-.6952444E-02	-1.0858630	.2244078E-01	3.504897*
-33	.1069556E-02	.1670478	.2351033E-01	3.671944*
-32	-.1590333E-02	-.2483851	.2192000E-01	3.423559*
-31	-.4391444E-02	-.6858746	.1752856E-01	2.737685*
-30	.6994778E-02	1.0924740	.2452333E-01	3.830159*
-29	-.9211556E-02	-1.4387000	.1531178E-01	2.391459[4]
-28	-.1663556E-02	-.2598212	.1364822E-01	2.131638
-27	-.7618111E-02	-1.1898290	.6030111E-02	.9418086
-26	-.5358556E-02	-.8369221	.6715556E-03	.1048864
-25	.5264556E-02	.8222408	.5936111E-02	.9271272
-24	.6807778E-03	.1063268	.6616889E-02	1.033454
-23	.4791222E-02	.7483136	.1140811E-01	1.781768
-22	.1089089E-01	1.7009860	.2229900E-01	3.482753*
-21	-.5860333E-02	-.9152919	.1643867E-01	2.567461[4]
-20	.5145889E-02	.8037070	.2158456E-01	3.371168*
-19	-.7764222E-02	-1.2126490	.1382033E-01	2.158519
-18	.7661000E-02	1.1965280	.2148133E-01	3.55504[7]
-17	-.1230289E-01	-1.9215180	.9178444E-02	1.433529*
-16	-.7354111E-02	-1.1485970	.1824333E-02	.2849322
-15	.4241778E-02	.6624990	.6066111E-02	.9474312
-14	.8235000E-02	1.2861780	.1430111E-01	2.233609
-13	-.2106667E-03	-.3290282E-01	.1409044E-01	2.200706
-12	.3221778E-02	.5031910	.1731222E-01	2.703897*
-11	.1914333E-02	.2989888	.1922656E-01	3.002866*
-10	.2220000E-03	.3467291E-01	.1944856E-01	3.037559*
-9	-.5588889E-02	-.8728966	.1385967E-01	2.164662
-8	-.2093222E-02	-.3269284	.1176644E-01	1.837734

Table 7.2 CONTINUED

DATE	AV. RESIDUAL	T-STAT	CAR	T-STAT
-7	-.5311444E-02	-.8295641	.6455000E-02	1.008170
-6	-.1233222E-01	-1.9260990	-.5877222E-02	-.9179297
-5	.5609778E-02	.8761591	-.2674444E-03	-.4177062E-01
-4	.1239111E-02	.1935297	.9716667E-03	.1517591
-3	.6021111E-03	.9404029E-01	.1573778E-02	.2457994
-2	.4736444E-02	.7397582	.6310222E-02	.9855575
-1	.1058000E-02	.1652430	.7368222E-02	1.150800
0	-.1102556E-02	-.1723018	.6265667E-02	.9785986
1	-.1051111E-03	-.1641670E-01	.6160556E-02	.9621819
2	-.4091222E-02	-.6389846	.2069333E-02	.3231973
3	.3577222E-02	.5587059	.5646556E-02	.8819032
4	-.1112411E-01	-1.7374110	-.5477556E-02	-.8555081
5	-.3141444E-02	-.4906442	-.8619000E-02	-1.346152
6	-.2650222E-02	-.4139231	-.1126922E-01	-1.760075
7	.3380889E-02	.5280417	-.7888333E-02	-1.232034
8	-.9267778E-03	-.1447481	-.8815111E-02	-1.376782
9	.1786444E-01	2.7901450*	.9049333E-02	1.413364
10	-.2684000E-02	-.4191986	.6365333E-02	.9941650
11	-.2799444E-02	-.4372292	.3565889E-02	.5569358
12	-.1087933E-01	-1.6991810	-.7313444E-02	-1.142245
13	.8903111E-02	1.3905260	.1589667E-02	.2482809
14	.6937000E-02	1.0834500	.8526667E-02	1.331731
15	.3665111E-02	.5724327	.1219178E-01	1.904164
16	.5394444E-03	.8425274E-01	.1273122E-01	1.988417
17	.1682889E-02	.2628408	.1441411E-01	2.251258
18	.5279222E-02	.8245315	.1969333E-01	3.075789*
19	-.5119889E-02	-.7996462	.1457344E-01	2.276143
20	.2578000E-02	.4026431	.1715144E-01	2.678786*
21	-.2968889E-03	-.4636938E-01	.1744833E-01	2.725155*
22	-.1997778E-03	-.3120215E-01	.1724856E-01	2.693953*
23	.7951333E-02	1.2418730	.2519989E-01	3.935827*
24	-.7173222E-02	-1.1203450	.1802667E-01	2.815482*
25	.2425778E-02	.3788684	.2045244E-01	3.194350*
26	-.9423000E-02	-1.4717240	.1102944E-01	1.722626
27	.4390222E-02	.6856837	.1541967E-01	2.408310[4]
28	.3453667E-02	.5394084	.1887333E-01	2.947718*
29	-.3662000E-02	-.5719468	.1521133E-01	2.375771[4]
30	-.5484333E-02	-.8565667	.9727000E-02	1.519204
31	.2439667E-02	.3810376	.1216667E-01	1.900242
32	-.2543667E-02	-.3972807	.9623000E-02	1.502961
33	-.2779222E-02	-.4340708	.6843778E-02	1.068891
34	.3862889E-02	.6033225	.1070667E-01	1.672213
35	-.1089333E-01	-1.7013670	-.1866667E-03	-.2915440E-01
36	.5825333E-02	.9098255	.5638667E-02	.8806711
37	.1058156E-01	1.6526730	.1622022E-01	2.533344[4]
38	-.1160000E-02	-.1811738	.1506022E-01	2.352170[4]
39	-.6334333E-02	-.9893233	.8725889E-02	1.362847
40	.3004778E-02	.4692991	.1173067E-01	1.832146

Table 7.2 CONTINUED

DATE	AV. RESIDUAL	T-STAT	CAR	T-STAT
41	.9083000E-02	1.4186220	.2081367E-01	3.250768*
42	.1387333E-02	.2166797	.2220100E-01	3.467447*
43	-.1070367E-01	-1.6717440	.1149733E-01	1.795703
44	-.7987556E-02	-1.2475310	.3509778E-02	.5481721
45	-.2352667E-02	-.3674496	.1157111E-02	.1807226
46	.1811433E-01	2.8291740*	.1927144E-01	3.009897*
47	.1232778E-02	.1925405	.2050422E-01	3.202437*
48	.2492222E-02	.3892459	.2299644E-01	3.591683*
49	-.2719444E-02	-.4247345	.2027700E-01	3.166949*
50	.2211778E-02	.3454449	.2248878E-01	3.512394*
51	.3636111E-02	.5679034	.2612489E-01	4.080297*
52	-.3881889E-02	-.6062900	.2224300E-01	3.474007*
53	-.1068911E-01	-1.6694710	.1155389E-01	1.804536
54	-.3567333E-02	-.5571614	.7986556E-02	1.247374
55	-.5903000E-02	-.9219558	.2083556E-02	.3254186
56	-.1354889E-02	-.2116123	.7286667E-03	.1138063
57	.2180367E-01	3.4053900*	.2253233E-01	3.519196*
58	-.5595222E-02	-.8738858	.1693711E-01	2.645311
59	.3595778E-02	.5616040	.2053289E-01	3.206914*
60	.3429444E-02	.5356253	.2396233E-01	3.742540*
61	-.2861111E-03	-.4468606E-01	.2367622E-01	3.697854*
62	.6229444E-02	.9729413	.2990567E-01	4.670795*
63	.6117333E-02	.9554313	.3602300E-01	5.626226*
64	-.2233889E-02	-.3488983	.3378911E-01	5.277328*
65	.4786889E-02	.7476368	.3857600E-01	6.024965*
66	-.4604222E-02	-.7191071	.3397178E-01	5.305858*
67	.1882778E-02	.2940603	.3585456E-01	5.599918*
68	.7227778E-02	1.1288650	.4308233E-01	6.728783*
69	-.2382222E-02	-.3720657	.4070011E-01	6.356718*
70	-.6620000E-02	-1.0339400	.3408011E-01	5.322778*
71	-.2435889E-02	-.3804476	.3164422E-01	4.942330*
72	-.3581222E-02	-.5593306	.2806300E-01	4.382999*
73	-.2925556E-03	-.4569258E-01	.2777044E-01	4.337307*
74	.1899222E-02	.2966287	.2966967E-01	4.633936*
75	.3207222E-02	.5009177	.3287689E-01	5.134853*
76	-.9158889E-03	-.1430474	.3196100E-01	4.991806*
77	-.4484556E-02	-.7004171	.2747644E-01	4.291389*
78	.7377778E-04	.1152293E-01	.2755022E-01	4.302912*
79	-.4822889E-02	-.7532594	.2272733E-01	3.549652*
80	-.1274556E-02	-.1990655	.2145278E-01	3.350587*
81	.4731333E-02	.7389599	.2618411E-01	4.089547*
82	-.1230111E-02	-.1921240	.2495400E-01	3.897423*
83	-.5302778E-02	-.8282105	.1965122E-01	3.069212*
84	.4531222E-02	.7077057	.2418244E-01	3.776918*
85	.7455222E-02	1.1643890	.3163767E-01	4.941306*
86	.2184000E-02	.3411065	.3382167E-01	5.282413*
87	.4851444E-02	.7577194	.3867311E-01	6.040132*
88	-.7722667E-02	-1.2061590	.3095044E-01	4.833973*

Table 7.2 CONTINUED

DATE	AV. RESIDUAL	T-STAT	CAR	T-STAT
89	-.4122222E-03	-.6438263E-01	.3053822E-01	4.769590*
90	.1254444E-03	.1959245E-01	.3066367E-01	4.789183*
91	-.9739000E-02	-1.5210790	.2092467E-01	3.268104*
92	.6302000E-02	.9842733	.2722667E-01	4.252377*
93	-.2500333E-02	-.3905128	.2472633E-01	3.861865*
94	-.1428011E-01	-2.2303290	.1044622E-01	1.631536
95	-.5589667E-02	-.8730181	.4856556E-02	.7585176
96	-.4476778E-02	-.6992023	.3797778E-03	.5931532E-01
97	-.6060667E-02	-.9465809	-.5680889E-02	-.8872655
98	-.7936667E-02	-1.2395830	-.1361756E-01	-2.126848
99	-.4832444E-02	-.7547519	-.1845000E-01	-2.881600*
100	.3374111E-02	.5269831	-.1507589E-01	-2.354617[4]

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*Significant at .005
4Significant at .010

TABLE 7.3
AVERAGE RESIDUALS & CUMULATIVE AVERAGE RESIDUALS
(AMEX FIRMS)

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
-100	.4439060E-02	.3624853	.4439060E-02	.3624853
-99	.1158341E-01	.9458791	.1602247E-01	1.308364
-98	.1019684E-01	.8326547	.2621930E-01	2.141019
-97	.5154035E-02	.4208688	.3137334E-01	2.561888[4]
-96	-.1327594E-01	-1.0840880	.1809740E-01	1.477800
-95	.1740358E-01	1.4211430	.3550098E-01	2.898943*
-94	-.1005750E-01	-.8212765	.2544348E-01	2.077666
-93	.1323138E-01	1.0804490	.3867485E-01	3.158115*
-92	.3288469E-01	2.6853020*	.7155954E-01	5.843417*
-91	.2690400E-02	.2196930	.7424994E-01	6.063110*
-90	.3008194E-01	2.4564350[4]	.1043319	8.519545*
-89	-.8626096E-02	-.7043908	.9570579E-01	7.815154*
-88	.1162907E-01	.9496078	.1073349	8.764762*
-87	-.2364728E-01	-1.9309920	.8368758E-01	6.833770*
-86	.2147389E-01	1.7535170	.1051615	8.587287*
-85	.6422556E-03	.5244539E-01	.1058037	8.639733*
-84	.1110004E-01	.9064082	.1169038	9.546141*
-83	.4584874E-02	.3743922	.1214886	9.920533*
-82	-.5467066E-02	-.4464303	.1160216	9.474103*
-81	.1439339E-03	.1175337E-01	.1161655	9.485856*
-80	-.6594119E-02	-.5384633	.1095714	8.947393*
-79	-.4611040E-02	-.3765289	.1049603	8.570864*
-78	-.3361378E-03	-.2744838E-01	.1046242	8.543416*
-77	-.8718772E-02	-.7119585	.9590543E-01	7.831457*
-76	.7609549E-02	.6213815	.1035150	8.452839*
-75	-.1683473E-01	-1.3746920	.8668025E-01	7.078146*
-74	-.1602438E-01	-1.3085210	.7065587E-01	5.769625*
-73	.3645036E-02	.2976468	.7430090E-01	6.067272*
-72	.9182239E-02	.7498044	.8348314E-01	6.817076*
-71	.8033928E-03	.6560354E-01	.8428653E-01	6.882680*
-70	.7077465E-02	.5779325	.9136400E-01	7.460612*
-69	-.1723968E-01	-1.4077600	.7412432E-01	6.052852*
-68	.8407163E-02	.6865131	.8253148E-01	6.739365*
-67	-.1552469E-02	-.1267717	.8097901E-01	6.612594*
-66	.1226321E-01	1.0013900	.9324222E-01	7.613984*
-65	.1616501E-01	1.3200040	.1094072	8.933988*
-64	-.6710699E-03	-.5479831E-01	.1087362	8.879190*
-63	.2650904E-02	.2164678	.1113871	9.095657*
-62	-.3005869E-02	-.2454536	.1083812	8.850204*
-61	-.1077455E-01	-.8798292	.9760664E-01	7.970375*
-60	-.4123539E-02	-.3367204	.9348310E-01	7.633654*
-59	.2280571E-01	1.8622710	.1162888	9.495925*
-58	-.6424972E-02	-.5246511	.1098638	8.971274*
-57	-.4707114E-02	-.3843741	.1051567	8.586900*
-56	-.1600665E-01	-1.3070730	.8915008E-01	7.279827*
-55	-.5097640E-02	-.4162637	.8405244E-01	6.863564*

TABLE 7.3 CONTINUED

DATE	AVERAGE RESIDUAL	T-TEST	CAR	T-TEST
-54	-.5792099E-02	-.4729719	.7826034E-01	6.390592*
-53	.6040042E-03	.4932184E-01	.7886434E-01	6.439914*
-52	.5075962E-03	.4144935E-01	.7937194E-01	6.481363*
-51	-.9894682E-02	-.8079811	.6947726E-01	5.673382*
-50	-.8065328E-02	-.6585995	.6141193E-01	5.014782*
-49	.6165426E-02	.5034571	.6757735E-01	5.518239*
-48	-.2171063E-02	-.1772849	.6540629E-01	5.340955*
-47	.2502670E-02	.2043633	.6790896E-01	5.545318*
-46	-.1270901E-01	-1.0377940	.5519995E-01	4.507524*
-45	-.1141135E-01	-.9318295	.4378860E-01	3.575695*
-44	.1234904E-02	.1008399	.4502351E-01	3.676535*
-43	-.6344434E-02	-.5180746	.3867907E-01	3.158460*
-42	-.1540925E-02	-.1258291	.3713815E-01	3.032631*
-41	-.8724495E-02	-.7124258	.2841365E-01	2.320205
-40	-.9902171E-02	-.8085926	.1851148E-01	1.511613
-39	-.1081798E-01	-.8833760	.7693500E-02	.6282367
-38	-.1156487E-01	-.9443655	-.3871370E-02	-.3161288
-37	.4704971E-02	.3841990	.8336010E-03	.6807029E-01
-36	-.1562346E-01	-1.2757820	-.1478986E-01	-1.207712
-35	-.6468808E-02	-.5282307	-.2125866E-01	-1.735943
-34	.2578029E-01	2.1051700	.4521627E-02	.3692276
-33	-.2433177E-01	-1.9868860	-.1981014E-01	-1.617659
-32	-.9084495E-02	-.7418228	-.2889463E-01	-2.359481*
-31	.3255972E-02	.2658766	-.2563866E-01	-2.093605
-30	.2352442E-02	.1920960	-.2328622E-01	-1.901509
-29	.1347150E-02	.1100058	-.2193907E-01	-1.791503
-28	-.4613391E-02	-.3767209	-.2655246E-01	-2.168224
-27	-.6834872E-02	-.5581227	-.3338733E-01	-2.726347*
-26	-.2431482E-02	-.1985502	-.3581881E-01	-2.924897*
-25	.5222866E-02	.4264894	-.3059595E-01	-2.498407*
-24	.2205888E-02	.1801287	-.2839006E-01	-2.318279
-23	-.1064723E-01	-.8694324	-.3903729E-01	-3.187711*
-22	.2206823E-02	.1802050	-.3683046E-01	-3.007506*
-21	-.1993549E-02	-.1627894	-.3882401E-01	-3.170296*
-20	.1387412E-01	1.1329340	-.2494990E-01	-2.037361
-19	-.7390994E-03	-.6035347E-01	-.2568899E-01	-2.097715
-18	.5495113E-02	.4487206	-.2019388E-01	-1.648994
-17	-.3984152E-02	-.3253383	-.2417803E-01	-1.974333
-16	.4781247E-03	.3904276E-01	-.2369991E-01	-1.935290
-15	.7317714E-02	.5975508	-.1638219E-01	-1.337739
-14	-.2595614E-02	-.2119530	-.1897781E-01	-1.549692
-13	-.4622864E-02	-.3774944	-.2360067E-01	-1.927187
-12	.1007252E-01	.8225034	-.1352815E-01	-1.104683
-11	.2257976E-01	1.8438210	.9051613E-02	.7391377
-10	.9810151E-02	.8010785	.1886176E-01	1.540216
-9	.6576596E-02	.5370324	.2543836E-01	2.077249
-8	-.1336928E-01	-1.0917100	.1206908E-01	.9855385
-7	.1788074E-02	.1460107	.1385716E-01	1.131549

TABLE 7.3 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
-6	.6273945E-02	.5123185	.2013110E-01	1.643868
-5	.1208894E-02	.9871598E-01	.2133999E-01	1.742584
-4	-.9854771E-02	-.8047221	.1148522E-01	.9378617
-3	-.7155078E-02	-.5842702	.4330146E-02	.3535916
-2	-.8146844E-02	-.6652559	-.3816698E-02	-.3116644
-1	.7203602E-02	.5882326	.3386904E-02	.2765682
0	.5377529E-02	.4391189	.8764432E-02	.7156870
1	.8640997E-02	.7056076	.1740543E-01	1.421295
2	-.2790574E-02	-.2278730	.1461486E-01	1.193422
3	.3009848E-02	.2457785	.1762470E-01	1.439200
4	-.8374419E-02	-.6838393	.9250285E-02	.7553608
5	-.6759557E-02	-.5519727	.2490727E-02	.2033881
6	-.1646980E-02	-.1344893	.8437477E-03	.6889885E-01
7	-.5674673E-02	-.4633831	-.4830926E-02	-.3944843
8	-.2634701E-02	-.2151447	-.7465627E-02	-.6096290
9	-.2922193E-03	-.2386207E-01	-.7757846E-02	-.6334911
10	.5255086E-02	.4291204	-.2502760E-02	-.2043707
11	.3030404E-02	.2474571	.5276445E-03	-.4308646E-01
12	-.5121255E-03	-.4181921E-01	.1551897E-04	.1267250E-02
13	-.2240384E-02	-.1829455	-.2224865E-02	-.1816783
14	.1268761E-01	1.0360460	.1046274E-01	.8543677
15	.1041217E-01	.8502381	.2087491E-01	1.704606
16	-.1318104E-01	-1.0763390	.7693870E-02	.6282669
17	.9032257E-02	.7375571	.1672613E-01	1.365824
18	.3076640E-01	2.5123260[4]	.4749253E-01	3.878150*
19	-.1649360E-03	-.1346837E-01	.4732759E-01	3.864682*
20	-.1306187E-01	-1.0666080	.3426572E-01	2.798074*
21	.8541890E-02	.6975147	.4280761E-01	3.495589*
22	-.1408794E-01	-1.1503950	.2871967E-01	2.345194[4]
23	-.4886754E-02	-.3990431	.2383292E-01	1.946151
24	-.3548602E-02	-.2897722	.2028432E-01	1.656379
25	-.9201161E-02	-.7513495	.1108315E-01	.9050295
26	.2694500E-02	.2200278	.1377765E-01	1.125057
27	.3989038E-01	3.2573730*	.5366803E-01	4.382430*
28	-.8581949E-02	-.7007858	.4508608E-01	3.681645*
29	.3797134E-02	.3100668	.4888322E-01	3.991711*
30	.2128718E-02	.1738271	.5101194E-01	4.165539*
31	.4356515E-02	.3557448	.5536845E-01	4.521283*
32	.1210310E-01	.9883165	.6747155E-01	5.509600*
33	.1086907E-01	.8875475	.7834062E-01	6.397147*
34	-.8799809E-02	-.7185758	.6954081E-01	5.678572*
35	.1454549E-01	1.1877570	.8408630E-01	6.866329*
36	.7783191E-03	.6355608E-01	.8486462E-01	6.929885*
37	-.1020883E-01	-.8336340	.7465579E-01	6.096251*
38	.1367508E-01	1.1166810	.8833087E-01	7.212932*
39	.8553588E-02	.6984699	.9688446E-01	7.911402*
40	-.3319764E-02	-.2710857	.9356469E-01	7.640317*
41	.8192763E-02	.6690056	.1017575	8.309322*

TABLE 7.3 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
42	-.1657477E-02	-.1353465	.1001000	8.173976*
43	-.6309147E-02	-.5151931	.9379083E-01	7.658783*
44	-.4294195E-02	-.3506558	.8949664E-01	7.308127*
45	.1068601E-01	.8725998	.1001827	8.180727*
46	-.4028848E-02	-.3289881	.9615380E-01	7.851739*
47	-.1884903E-01	-1.5391760	.7730477E-01	6.312562*
48	.1183403E-02	.9663447E-01	.7848818E-01	6.409197*
49	-.9598721E-02	-.7838135	.6888946E-01	5.625383*
50	.1408775E-01	1.1503790	.8297720E-01	6.775762*
51	.1093045E-01	.8925603	.9390766E-01	7.668322*
52	.1372815E-01	1.1210150	.1076358	8.789337*
53	.1257675E-01	1.0269930	.1202126	9.816331*
54	.2921665E-02	.2385777	.1231342	10.05491*
55	-.3218130E-02	-.2627865	.1199161	9.792122*
56	-.6754774E-02	-.5515821	.1131613	9.240540*
57	-.1959549E-01	-1.6001310	.9356583E-01	7.640409*
58	-.2077974E-01	-1.6968340	.7278609E-01	5.943575*
59	.1448439E-02	.1182768	.7423453E-01	6.061852*
60	.9852071E-02	.8045016	.8408660E-01	6.866354*
61	-.1875894E-01	-1.5318200	.6532766E-01	5.334534*
62	-.6584757E-03	-.5376988E-01	.6466918E-01	5.280764*
63	-.1516487E-01	-1.2383340	.4950432E-01	4.042429*
64	-.5692188E-02	-.4648133	.4381213E-01	3.577616*
65	-.7757995E-02	-.6335033	.3605413E-01	2.944113*
66	.7065750E-02	.5769759	.4311988E-01	3.521089*
67	.2066814E-01	1.6877210	.6378802E-01	5.208810*
68	.1607883E-02	.1312967	.6539590E-01	5.340106*
69	.7581940E-02	.6191269	.7297784E-01	5.959233*
70	-.1084232E-02	-.8853635E-01	.7189361E-01	5.870697*
71	-.6069269E-02	-.4956051	.6582434E-01	5.375092*
72	-.9376812E-02	-.7656928	.5644753E-01	4.609399*
73	.1071177E-01	.8747030	.6715930E-01	5.484102*
74	-.3779386E-03	-.3086176E-01	.6678136E-01	5.453240*
75	.7398829E-02	.6041744	.7418019E-01	6.057415*
76	.2567615E-02	.2096666	.7674780E-01	6.267081*
77	.1341926E-01	1.0957920	.9016707E-01	7.362873*
78	-.6537805E-02	-.5338649	.8362926E-01	6.829008*
79	-.1009463E-01	-.8243082	.7353463E-01	6.004700*
80	.6774479E-02	.5531912	.8030911E-01	6.557891*
81	.6968116E-02	.5690032	.8727723E-01	7.126894*
82	-.3672144E-03	-.2998604E-01	.8691001E-01	7.096908*
83	-.7645300E-02	-.6243008	.7926471E-01	6.472607*
84	-.4176265E-02	-.3410259	.7508845E-01	6.131581*
85	-.3534960E-02	-.2886582	.7155349E-01	5.842923*
86	-.1351900E-01	-1.1039360	.5803449E-01	4.738987*
87	.1936983E-02	.1581704	.5997147E-01	4.897157*
88	-.1527685E-01	-1.2474780	.4469463E-01	3.649679*
89	-.3543288E-02	-.2893383	.4115134E-01	3.360341*

TABLE 7.3 CONTINUED

DATE	AV. RESIDUAL	T-TEST	CAR	T-TEST
90	.7424398E-02	.6062624	.4857574E-01	3.966603*
91	-.1293044E-01	-1.0558750	.3564530E-01	2.910728*
92	.1150303E-01	.9393161	.4714833E-01	3.850044*
93	-.8143026E-02	-.6649442	.3900530E-01	3.185100*
94	-.2956409E-03	-.2414148E-01	.3870966E-01	3.160958*
95	-.1190742E-01	-.9723372	.2680225E-01	2.188621
96	.3694534E-02	.3016887	.3049678E-01	2.490310[4]
97	-.5732886E-02	-.4681367	.2476390E-01	2.022173
98	-.7207218E-02	-.5885279	.1755668E-01	1.433645
99	.1923970E-01	1.5710780	.3679638E-01	3.004723
100	-.4670042E-02	-.3813469	.3212634E-01	2.623376*

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*Significant at .005
4Significant at .010

GRAPH I

CUMULATIVE AVERAGE RESIDUALS--WHOLE SAMPLE

COMPLETE SAMPLE

Day Relative to Interlisting Date
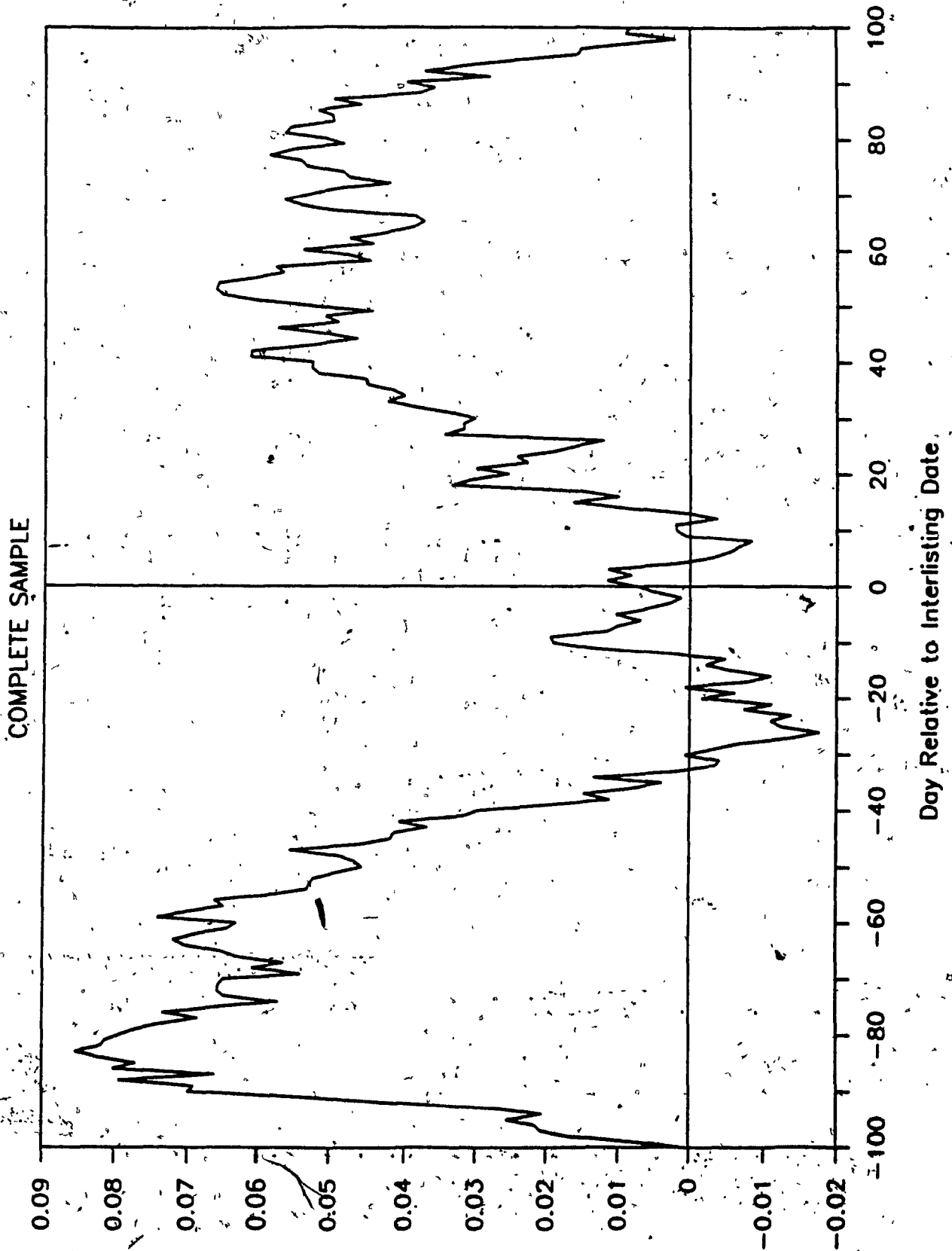
GRAPH II

CUMULATIVE AVERAGE RESIDUALS--NYSE SAMPLE

NYSE SAMPLE

Day Relative to Interlisting Date
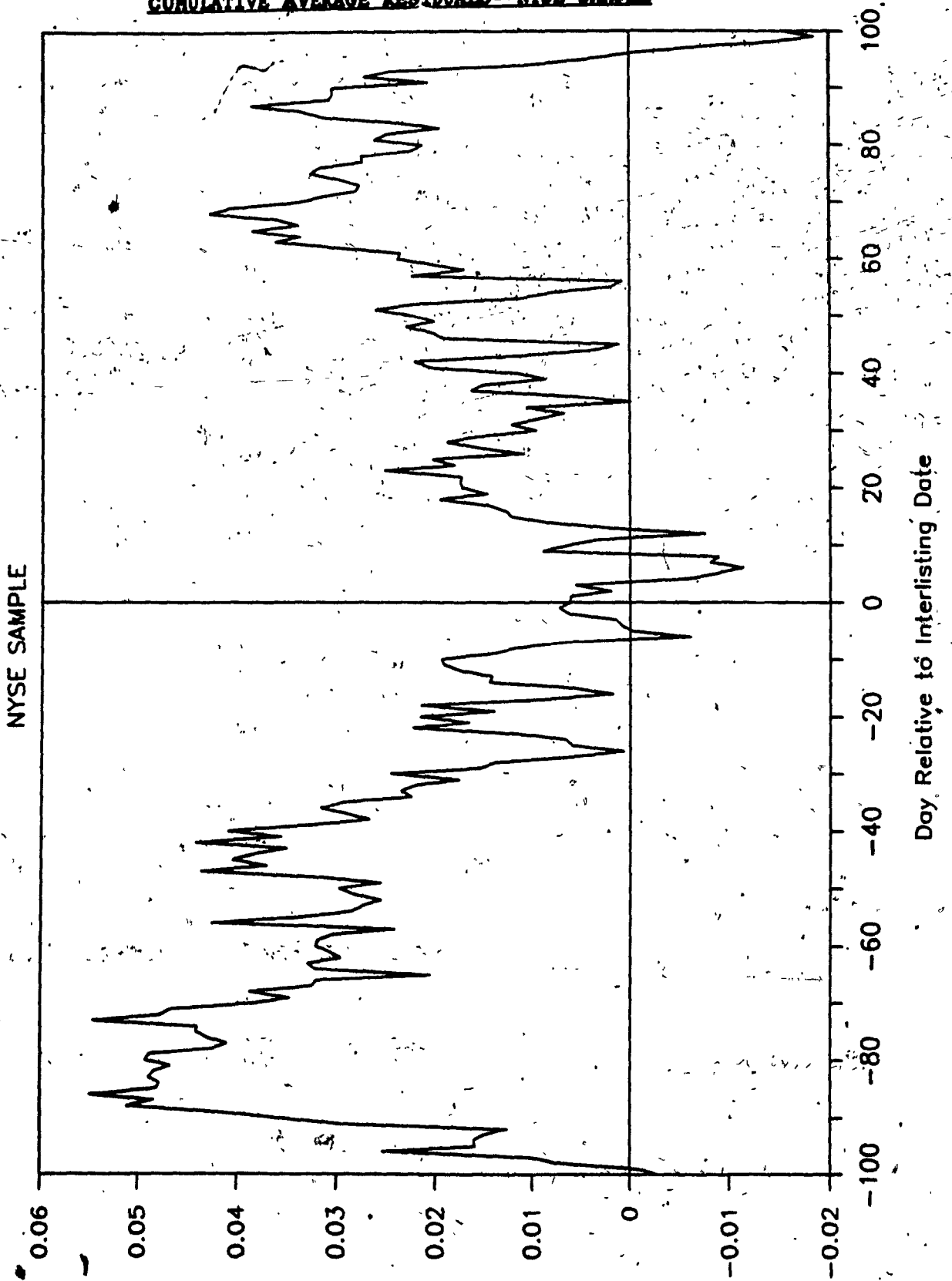
GRAPH III

CUMULATIVE AVERAGE RESIDUALS--AMEX SAMPLE

AMEX SAMPLE

Day Relative to Interlisting Date
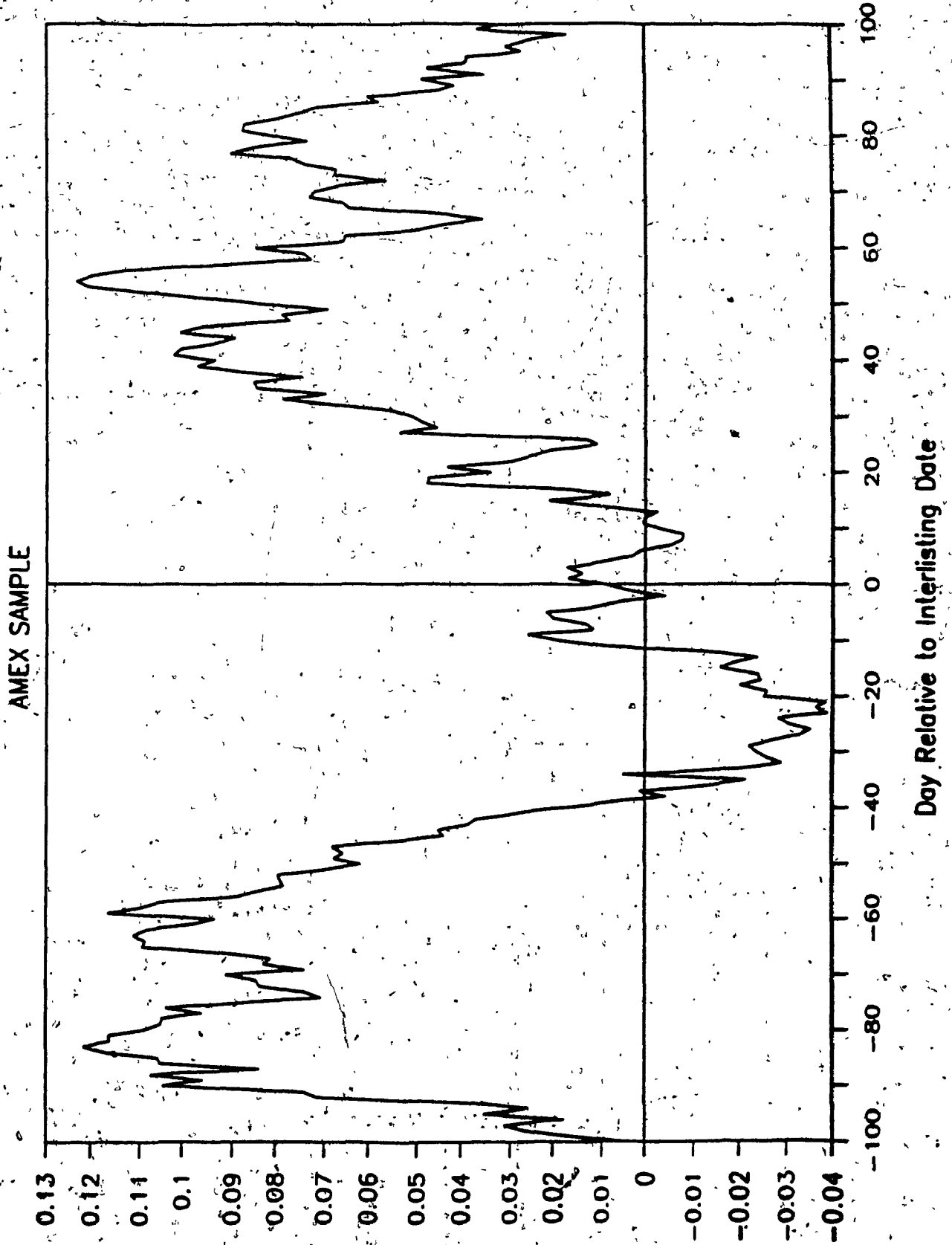
7.3 INTERVENTION ANALYSIS

Intervention analysis (IA), represents an alternative to the more traditional approaches used in most previous studies of market efficiency by explicitly modelling the error term in an expanded market model regression, thereby alleviating the problem of autocorrelated residuals. In addition, intervention analysis specifically permits the possibility of non-stationarity in beta estimates by allowing beta to vary over the estimation period. With this methodology, as was the case in the market model approach to the calculation of abnormal returns, any heteroscedasticity which is present will persist. Nevertheless, there is reason to believe that the amount of heteroscedasticity may be substantially reduced when OLS estimation of the market model is replaced by intervention analysis. Larcker, Gordon, and Pinches (1980) suggest that the removal of autocorrelation and the allowance for moving betas may serve to substantially reduce heterostedasticity in the IA model. Finally, IA, by treating securities on a case by case basis, allows one to avoid the problems associated with forcing the same model on all securities.

The development of the IA model is given below. Assume that the time series returns on a specific security can be expressed as follows:

$$(7.4) \quad R_t = f(W, \delta) + N_t$$

where: R_t = the return on a specific security at time t

W = a set of exogenous variables

δ = a set of specified intervention, eg. the international interlisting event, which may change the character of the time series returns

N_t – the noise term

In conventional market model approaches to the conduct of event studies (7.4) is expressed as:

(7.5) $\quad \bar{R}_t = \alpha_j + \beta_j \bar{R}_{mt} + \bar{u}_{jt}$

$\bar{R}_{mt}$ – the return on the market portfolio at time t

$\bar{u}_{jt}$ – the error term

α_j, β_j – regression parameters

Thus, $f(W,\delta)$ of equation (7.4) now corresponds to $\beta_j R_{mt}$, and the noise component is modelled as the error term u_t in equation (7.5). The OLS method is applied to equation (7.5) and it is assumed that the error term obeys the assumptions that:

(i) $\quad E(u_{jt}) = 0$, for all t

(ii) $\quad cov(u_{jt}, u_{jt+k}) = 0$ for all k not equal to 0

(iii) $\quad cov(u_{jt}, R_{mt}) = 0$ for all t

(iv) $\quad var(u_{jt}) = \sigma^2$

An important advantage gained from the use of intervention analysis lies in the fact that the error term is modelled in order to alleviate the possibility of autocorrelated residuals which in OLS estimation, by assumption (ii) above, is not admitted. Indeed, when autocorrelation is not removed, although the coefficient estimates will be unbiased, they will have smaller sampling variances and thus the t-values associated with the estimates will be overstated.

In contrasting equations (7.4) and (7.5) we focus upon two areas: changing betas and the error component. As regards changing betas, expand equation (7.5) as follows:

(7.6) $\quad R_t = \alpha + \sum_{j=1}^{J} \beta_j W_j + \sum_{k=1}^{K} \zeta_k \delta_k + N_t$

where: α — the constant term

β, ξ — model parameters

J, K — the number of exogenous variables and

interventions, respectively.

Consider possible changes in systematic risk. It would be plausible, given the discussion of risk earlier, that three beta components may prevail in three distinct time periods: the estimation period beta, the pre-listing period beta, and the post-listing period beta. Thus risk may be represented as:

$$(7.7) \qquad \sum_{j=1}^{J} \beta_j W_j = \beta_1 R_{mt} I_{est}(t) + \beta_2 R_{mt} I_{pre}(t) + \beta_3 R_{mt} I_{post}(t)$$

where, in general, the I's are dummy variables taking values of zero or one. Thus:

β_1 — the systematic risk in the estimation period

$I_{est}(t)$ — 1 if the estimation period observations are used and is zero otherwise.

β_2 — the systematic risk during the pre-listing period

$I_{pre}(t)$ — 1 if the pre-listing period observations are used and is zero otherwise.

β_3 — the systematic risk in the post listing period.

$I_{post}(t)$ — 1 if the post listing observations are used and is zero otherwise.

Next, consider the interventions. If the date of actual listing is considered as the event then the functional form for the intervention can be expressed as:

$$(7.8) \qquad \sum_{k=1}^{K} \xi_k \delta_k = \xi_1 I_1(t) + \xi_2 I_2(t) = \xi_1 \delta_1 + \xi_2 \delta_2$$

where, in general, $\delta-I$, are dummy variables taking values of zero or one as follows:

$\delta_1 - I_1(t) - 1$ for observations in the pre-listing period and is zero otherwise.

$\delta_2 - I_2(t) - 1$ for observations from the listing date onward and is zero otherwise.

In the case of international interlisting it is probably the case that whatever information is associated with listing is released prior to the event itself. The time between the formal listing application and its approval is not long and furthermore, virtually all applications are approved since firms must undergo informal evaluation prior to formal application. Therefore, the event of importance is perhaps more correctly identified as the initiation of the listing process, whereby informal approval from the listing authorities is sought prior to formal application. Usually firms will approach the exchange and seek informal approval and thus almost all formal applications for listing are approved. Since the date of informal approval is difficult to precisely establish, the event of interlisting will be considered to occur when actual listing takes place. This definition suggests that quite likely some abnormal returns, such as occur, will be present prior to the event date used in this study.

Incorporating expressions (7.7) and (7.8), the time series return on a security can be expressed as:

$$(7.9) \quad R_t - \alpha + \beta_1 R_{mt} I_{est}(t) + \beta_2 R_{mt} I_{pre}(t) + \beta_3 R_{mt} I_{post}(t) + \xi_1 I_{pre}(t) + \xi_2 I_{post} + N_t$$

What remains to be considered is the specific model to employ in

representing the noise component, N_t, and then the estimation procedure used to evaluate (7.9).

If the disturbances are not serially correlated and the error term has a constant variance then OLS could be used to estimate (7.9).[51] However, if the error term exhibits autocorrelation various functional forms of N_t can be posited and diagnostic checks carried out in order to ascertain the appropriateness of the model selected. The structural forms which are considered are:

(i) an autoregressive process of order p,

(ii) a moving average process of order q,

(iii) an autoregressive moving average of order (p,q), or

(iv) an autoregressive integrated moving average of order (p,d,q).

One of the first three models is appropriate if the distribution of the error term is stationary.[52] If homogeneous non-stationarity is found then the noise term can appropriately be modelled as an autoregressive integrated moving average (ARIMA) of order (p,d,q). The reader is referred to Box and Jenkins (1976) for a complete discussion of possible structural forms of the model.

The problem which must now be confronted is that of selecting the appropriate model or structure which best represents the noise component. A first step in identification requires the computation of the sample autocorrelation function which is then compared to its theoretical value. A graph of the sample autocorrelation function, the

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[51]This assumes that multicollinearity is not a problem.

[52]A stationary process is characterized by a constant and finite mean and variance and a set of covariances which are independent of time and are functions only of lag length. See Johnston (1984).

correlogram, is useful in this regard. Another extremely useful tool in model identification is the partial autocorrelation function.

Inspection of the correlogram and the partial autocorrelation function aid in the selection of the appropriate model structure for the noise term. To distinguish what may or may not be important in the sample correlogram, Bartlett's approximation can be used to test whether the sample autocorrelations at lags greater than q can reasonably be considered to be zero. Bartlett's approximation is given by:

$$(7.10) \qquad r_k > 2(1/\sqrt{T})(1 + 2\sum_{i=1}^{q} r_i)^{.5}$$

The tendency for the autocorrelation function not to die out rapidly suggests non-stationarity and hence leads us to suspect that an ARIMA model may be appropriate. Examining the differences at 0,1,and 2, for the first twenty estimated autocorrelations is usually sufficient to tentatively determine the required degree of differencing to obtain stationarity.[53]

Once an ARIMA model of degree d is postulated, we need to determine the orders (p) and (q) of the autoregressive and moving average components. As reported by Box and Jenkins (1970):

> ...whereas the autocorrelation function of an autoregressive process of order p tails off, its partial autocorrelation function has a cut off after lag p. Conversely, the autocorrelation function of a moving average process of order q has a cutoff after lag q, while its partial autocorrelations tail off. If both the autocorrelations and partial autocorrelations tail off, a mixed process is suggested. Furthermore, the autocorrelation function for a mixed process, containing a pth order autoregressive component and a qth order moving average component, is a mixture of exponentials and dampened sine waves after the first q-p lags. Conversely the partial autocorrelation function for a mixed process is dominated by a

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[53]See Box and Jenkins (1976), page 175.

mixture of exponentials and dampened sine waves after the first p-q lags.

In general, autoregressive (moving average) behavior, as measured by the autocorrelation function, tends to mimic moving average (autoregressive) behavior as measured by the partial autocorrelation function.[54]

In the previous pages three components of the IA model were discussed, the interventions, the risk premia, and the noise component. Assume for exposition that the noise term is modelled as an ARIMA process of order (p,d,q), such that the IA model is given by:

$$(7.11) \quad R_t = \alpha + \beta_1 R_{mt} I_{est}(t) + \beta_2 R_{mt} I_{pre}(t) + \beta_3 R_{mt} I_{post}(t) +$$
$$+ \xi_1 I_{pre}(t) + \xi_1 I_{post}(t) + (\theta B/(1-B)^d \phi B) a_t$$

Non linear estimation of (7.11) is required to estimate the parameters $(\alpha, \beta_1, \beta_2, \beta_3, \xi_1, \xi_2$, and $[\Phi_1, \ldots, \Phi_p]$ and $[\theta_1, \ldots, \theta_q])$. The adequacy of the selected noise model can be checked by examining the residuals obtained and repeating the model specification procedure until (a_t) becomes purely white noise.

At this point it is useful to highlight the manner in which the coefficients on the intervention term, the ξ_i's are interpreted. Larcker et.al. (1980) provide a succinct description of the proper interpretation of these coefficients. That is, when both ξ^1 and ξ_2 are zero there is no excess risk adjusted return. Conversely, ξ_1 and ξ_2 both positive (negative) imply excess risk adjusted returns during the pre and post event period. Similarly, if ξ_1 is zero and ξ_2 is not, abnormal risk adjusted returns are observed only in the post event period, while the reverse situation is consistent with abnormal risk adjusted returns in the pre-event period only.

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[54]George E. P. Box and Gwilym M. Jenkins, Time Series Analysis Forecasting and Control (Toronto: Holden-Day, 1976), pp. 175-176.

Essentially, once the steps are taken to appropriately model the error term, the estimation and interpretation of the IA model is relatively straightforward. As discussed elsewhere in this chapter, the advantage of using IA analysis as compared to the market model approach are threefold. Firstly, the IA model proceeds on a firm by firm basis rather than inferring market response from the portfolio approach used in the conventional market model calculations of abnormal returns. Secondly, explicit recognition of changing betas is allowed when intervention analysis is employed. Finally, the problem of autocorrelation in market model residuals is specifically addressed and an alternative structure for the noise component in the market model regression is admitted.

In carrying out intervention analysis the market portfolio employed is the daily return on the value weighted NYSE index and thus conversion at the daily closing exchange rate is required. In the period prior to the interlisting event daily returns from the TSE are used for the individual firms. Following interlisting daily returns in U.S. dollars converted at the daily exchange rate are employed. The observation period is divided into three sub-periods. The pre and post event period is defined to occur at plus or minus one hundred and twenty-five days. The period encompassing minus one hundred and twenty-six days to minus one hundred and seventy-nine days is used as the estimation period. This break-down varied slightly from firm to firm since missing observations sometimes prohibited the use of all three hundred and five observations.

The empirical results obtained from the intervention analysis fall in three categories as follows: the returns model derived, estimation of the risk parameters, and estimation of the intervention parameters which provide evidence regarding the market's response to the interlisting event. Since it would be tedious to discuss such results on a firm by firm basis, they are presented in tabulated form in Tables 7.4 through 7.21. The discussion of these results will thus be contained to the general characteristics that appear therein. The results are obtained from estimation of equation 7.11. Firstly, in deriving the models for all eighteen cases, a multiplicity of specifications were considered and appropriate diagnostic checks carried out. That is the pattern of the autocorrelations and partial autocorrelations of the residuals obtained from ordinary least squares regression were inspected. Bartlett's test was applied to determine the number of autocorrelations and partial autocorrelations which were in fact statistically different from zero. The information obtained at this stage was then used to identify a tentative model. The procedure was repeated and either additional moving average terms, additional autoregressive terms, or both, were included in the model specification. Using Bartlett's approximate criterion, the residuals were assumed to be white noise at the five percent confidence level if no more than five of the first one hundred autocorrelation were statistically different from zero. For the majority of firms in the sample, the final model identified conformed to this criteria. In several cases, however, as many as nine significant autocorrelations persisted. Although this occurred infrequently, the principle of parsimonious model specification

prevailed, and the hypothesis of autocorrelated residuals was rejected at essentially a lower significance level in such cases.

As seen in Tables 7.4 through 7.21, no two firms are described by precisely the same model. Nevertheless, some general tendencies can be noted and the reader is referred to the tabulated empirical evidence regarding the model identified for a specific firm. First, an ARIMA model was never identified. For seven of the eighteen firms in the sample, a moving average process adequately described the pattern of security returns. The MA model varied from a minimum of two moving average terms to a maximum of five moving average terms. In the remaining eleven cases, autoregressive moving average models were specified. From two to four moving average terms were incorporated, while from as few as one to as many as eight autoregressive terms were identified. However, for the most part only two or three autoregressive terms were specified in these ARMA models.

In regard to changes in systematic risk, fifteen of the eighteen firms in the sample showed evidence of significant increases in systematic risk from the pre to post listing period. This evidence is thus congruent with that obtained in the multinomial logit analysis. Support is also lent to the findings of Kalay and Lowenstein (1985) that increases in systematic risk appear to accompany events. Moreover, this evidence contradicts that obtained in the listing literature which never detected a change in risk when the firm moved from the over-the-counter market to an organized exchange. Since the market portfolio was proxied by the New York Stock exchange valued weighted index translated to Canadian dollars at the daily exchange rate, the importance of the thin

trading argument in contributing to these increases in measured systematic risk is debatable. Moreover, following the interlisting event, U.S. returns for the specific firms translated at the daily exchange rate were used in place of Canadian returns. Nevertheless, the evidence provided by Taylor (1986) which documented increases in liquidity following interlisting, tends to lend some support to the argument that an attenuation of the thin trading bias may in part be responsible for increases in systematic risk. Comparisons of the estimation period beta and the post listing beta can aid in disentangling the thin trading puzzle. For eight firms, beta in the post listing period is significantly greater than the beta of the estimation period, among those firms which experienced increases in beta from the pre to post listing period. Another four firms in this sub-group showed no significant change in beta when the estimation period beta is compared to the post listing beta. Finally, two other firms which experienced significant increases in systematic risk following interlisting, have post listing betas which are significantly lower than their estimation period counterparts.

Among the three remaining firms for which beta did not increase in the post listing period as compared to the pre-listing period, only one showed evidence of a significant decline in beta following interlisting. Westcoast Transmission was the only firm in the sample that experienced a decline in systematic risk following the interlisting event. Even here the post listing beta did not differ significantly from the estimation period beta. Neither Chieftain Development nor Bow Valley

exhibited significant changes in beta from the pre to post listing period.

In summary, the majority of interlisted firms experienced significant increases in systematic risk following interlisting. Several factors are useful in explaining such a phenomenon. Firstly, an attenuation of the thin trading bias may be at work. Secondly, the results support the hypothesis that events of importance are frequently accompanied by increases in systematic risk. Thirdly, increased systematic risk lends support to the evidence obtained in the multinomial logit analysis that showed total risk first increasing and then declining as the interlisting life cycle progresses. Since the observation period used in the intervention analysis is of much shorter duration than that used by the multinomial logit analysis, failure to detect decreases in risk remains consistent with the latter analysis. A forth possible explanation involves the role of exchange risk. Theoretically, this should not play a role unless the capital market is segmented since U.S. investors could have purchased shares in the interlisted firms while exclusively listed on the TSE. Nevertheless, it is tempting to attribute at least part of the increase in systematic risk to the addition of foreign exchange risk, particularly when the motivation for international interlisting was hypothesized to derive in part from the partially segmented nature of the North American capital market.

One of the primary objectives in using intervention analysis was to facilitate the investigation of the market's response to the interlisting event itself. Recall, that an earlier study by Switzer

(1986) did detect significant abnormal returns using a mean adjusted returns model. Corroborating evidence was supplied by the conventional event study conducted in this dissertation using the OLS market model approach to detecting abnormal returns. Both analyses, however, contain a drawback which may be critical to the interpretation of the evidence uncovered. Specifically, both make the assumption of invariant systematic risk. Since the evidence in this dissertation points to increases in systematic risk following the interlisting event in the majority of firms examined, clearly the hypothesis of constant risk is misleading. In order to detect the existence of abnormal returns within the intervention analysis framework, the coefficients on the intervention dummies are examined. Weak support is lent to the findings uncovered by the conventional event study methodology in that in eight cases, the coefficient on either the pre-event, post-event or both, intervention dummies is statistically significant, although it should be emphasized that high critical t values were not used. However, with the exceptions of Bow Valley and Northgate Exploration, these coefficients are negative. For Bow Valley, as indicated in Table 7.10, the coefficient on the post event intervention dummy is significantly positive, indicating the presence of positive excess returns following interlisting, once possible autocorrelation was removed and changes in systematic risk were considered. Notably, in the case of Bow Valley, no significant change in systematic risk appeared to occur throughout the observation period. In the case of Northgate Exploration, as indicated in Table 7.21, the coefficient on the pre-event intervention dummy is significantly positive. Unlike Bow Valley, systematic risk increased

from the pre to post event period for Northgate Exploration. Both Westcoast Transmission and CP Enterprises, as can be seen in Tables 7.9 and 7.11, respectively, exhibit evidence of significant negative abnormal returns both during the pre-event period as well as the post event period. In the case of Westcoast Transmission, recall that systematic risk had declined in the post-event period while CP enterprises had undergone increases in systematic risk. Both Total Petroleum and Page Petroleum exhibit significant negative abnormal returns in the pre-event period. Negative risk adjusted abnormal returns following interlisting are evidenced for Mitel and Numac Oil and Gas, as seen in Tables 7.4 and 7.6. It should be pointed out that the magnitude of the excess returns is never large in any cases where they were detected. Also, although some firms did appear to experience excess returns around the listing period the evidence provided never reveals strongly significant coefficients on the intervention dummies. In particular, at the .005 and .01 level, the hypothesis of zero coefficients is always rejected.

TABLE 7.4
INTERVENTION ANALYSIS--MITEL

MODEL: AR(2) AT LAGS 1,3
MA(2) AT LAGS 5,17

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0077	0.0043	1.7840[2]
AR(LAG 1)	- 0.2076	0.0502	4.1364*
AR(LAG 3)	-0.1031	0.0501	-2.0562[3]
β(EST)	1.2196	0.3716	3.2817*
β(PRE)	1.2555	0.2625	4.7822*
β(POST)	2.0800	0.2739	7.5934*
ξ_1	-0.0031	0.0050	-0.6245
ξ_2	-0.0075	0.0050	-1.4852[1]
MA(LAG 5)	0.0859	0.0597	1.4376[1]
MA(LAG 17)	-0.0745	0.0602	-1.2387

β(EST - PRE)	-0.0359	0.1091	-0.3291
β(EST - POST)	-0.8603	0.0977	-8.8055*
β(PRE - POST)	-0.8244	0.0114	-72.3158*

R^2 = .3045   Number of Observations = 298
DW = 1.8800   Degrees of Freedom = 288

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.5
INTERVENTION ANALYSIS--PAGE PETROLEUM

MODEL: AR(2) AT LAGS 2,3
MA(3) AT LAGS 30,33,38

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0070	0.0049	1.4366[1]
AR(LAG 2)	0.0591	0.0524	-1.1292
AR(LAG 3)	-0.0245	0.0527	-0.4654
β(EST)	1.9699	0.7938	2.4816[4]
β(PRE)	1.0197	0.3527	2.8908*
β(POST)	2.2489	0.2798	8.0375*
ξ_1	-0.0071	0.0056	-1.2649[1]
ξ_2	-0.0045	0.0058	-0.7780
MA(LAG 30)	-0.0907	0.0623	-1.4567[1]
MA(LAG 33)	0.1155	0.0654	1.7670[2]
MA(LAG 38)	0.1543	0.0670	2.3045[4]
β(EST - PRE)	0.9502	0.4411	2.1542[3]
β(EST - POST)	-0.2790	0.5140	-0.5428
β(PRE - POST)	-1.2291	0.0729	-16.8601*

R^2 = .2464   Number of Observations = 296
DW = 2.0500   Degrees of Freedom = 285

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.6
INTERVENTION ANALYSIS--NUMAC OIL AND GAS

MODEL: AR(1) AT LAG 2
         MA(3) AT LAGS 5,26,34

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0064	0.0029	2.2290[4]
AR(LAG 2)	-0.0744	0.0559	-1.3306[1]
β(EST)	0.5755	0.5590	1.0295
β(PRE)	1.3691	0.3066	4.4645*
β(POST)	1.9517	0.4439	4.3961*
ξ_1	-0.0022	0.0034	-0.6608
ξ_2	-0.0054	0.0033	-1.6319[1]
MA(LAG 5)	-0.1847	0.0587	-3.1453*
MA(LAG 26)	-0.1744	0.0612	-2.8492*[2]
MA(LAG 34)	0.0715	0.0622	1.1504
....			
β(EST - PRE)	-0.7936	0.2524	-3.1440*
β(EST - POST)	-1.3762	0.1151	-11.9566*
β(PRE - POST)	-0.5826	0.1373	-4.2433*

R^2 = .1587   Number of Observations = 295
DW = 2.1478   Degrees of Freedom   = 285

Significance: (*) significant at .005
               (1) significant at .100
               (2) significant at .050
               (3) significant at .025
               (4) significant at .010

TABLE 7.7
INTERVENTION ANALYSIS--TOTAL PETROLEUM

MODEL: AR(3) AT LAGS 1,3,13,17
          MA(2) AT LAGS 20,26

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0092	0.0067	1,3615[1]
AR(LAG 1)	-0.1385	0.0521	-2.6591*
AR(LAG 3)	0.1610	0.0525	3.0649*
AR(LAG 13)	-0.1125	0.0537	-2.0967[3]
AR(LAG 17)	-0.0594	0.0543	-1.0950
β(EST)	0.7861	1.2373	0.6353
β(PRE)	2.2391	0.5036	4.4462*
β(POST)	2.5792	0.3206	8.0438*
ξ_1	-0.1236	0.0077	-1.6067[1]
ξ_2	-0.0062	0.0074	-0.8431
MA(LAG 20)	-0.1193	0.0634	-1.8836[2]
MA(LAG 26)	-0.1302	0.0682	-1.9089[2]
- - - - - - - - -			
β(EST - PRE)	-1.4530	0.9495	-1.5303[1]
β(EST - POST)	-1.7931	0.9167	-1.9560[2]
β(PRE - POST)	-0.3401	0.1830	-1.8585[2]

R^2 = .2905   Number of Observations = 480
DW = 2.0859   Degrees of Freedom = 268

Significance: (*)   significant at .005
               (1)   significant at .100
               (2)   significant at .050
               (3)   significant at .025
               (4)   significant at .010

TABLE 7.8
INTERVENTION ANALYSIS--BOW VALLEY

MODEL: MA(4) AT LAGS 2,18,20,21

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	-0.0017	0.0062	-0.2789
β(EST)	0.5211	0.9321	0.5591
β(PRE)	0.6696	0.4911	1.3636[1]
β(POST)	0.6443	0.7064	0.9121
ξ_1	0.0055	0.0073	0.7537
ξ_2	0.0096	0.0074	1.2894[1]
MA(LAG 2)	0.0654	0.0587	1.1138
MA(LAG 18)	0.0967	0.0592	1.6342[1]
MA(LAG 20)	0.1824	0.0598	3.0516[*]
MA(LAG 21)	-0.1108	0.0594	1.8650[2]

β(EST - PRE)	-0.1485	0.4410	-0.3367
β(EST - POST)	-0.1232	0.2257	-0.5458
β(PRE - POST)	0.0253	0.2153	0.1175

R^2 = .0710   Number of Observations = 291
DW = 1.8697   Degrees of Freedom = 281

Significance: (*) significant at .005
               (1) significant at .100
               (2) significant at .050
               (3) significant at .025
               (4) significant at .010

TABLE 7.9
INTERVENTION ANALYSIS--WESTCOAST TRANSMISSION

MODEL: MA(4) AT LAGS 1,10,16,22

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0022	0.0014	1.5297[1]
β(EST)	0.0832	0.6363	0.1307
β(PRE)	0.2977	0.3689	0.8069
β(POST)	0.1396	0.3747	0.3725
ξ_1	-0.0020	0.0017	-1.2021
ξ_2	-0.0036	0.0016	-2.2592[3]
MA(LAG 1)	-0.2338	0.0555	-4.2090*
MA(LAG 10)	0.1027	0.0558	1.8047[2]
MA(LAG 16)	-0.1641	0.0564	-2.9070*
MA(LAG 22)	-0.1901	0.0596	-3.3388*
β(EST - PRE)	-0.2145	0.2674	-0.8022
β(EST - POST)	-0.0564	0.2616	-0.2156
β(PRE - POST)	0.1581	0.0058	27.2586*

R^2 = .0854   Number of Observations = 299
DW = 1.9311   Degrees of Freedom = 289

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.10
INTERVENTION ANALYSIS--UNITED VESTBURNE INTERNATIONAL

MODEL: AR(4) AT LAGS 33,36,39,47
MA(4) AT LAGS 6,10,18,24

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	-0.0031	0.0289	-0.1063
AR(LAG 33)	-0.1012	0.0614	-1.6488[2]
AR(LAG 36)	-0.1243	0.0612	-2.0315[3]
AR(LAG 39)	0.1112	0.0613	1.8154[2]
AR(LAG 47)	-0.1318	0.0635	-2.0778[3]
β(EST)	1.9521	3.7006	0.5275
β(PRE)	0.8981	0.3507	0.5275
β(POST)	1.4511	0.2598	5.5856*
ξ_1	0.0074	0.0289	0.2549
ξ_2	0.0061	0.0289	0.2124
MA(LAG 6)	-0.0851	0.0646	-1.3189[1]
MA(LAG 10)	-0.1766	0.0648	-2.7266*
MA(LAG 18)	-0.0945	0.0659	-1.4333[1]
MA(LAG 24)	0.1153	0.0667	1.7279[2]
- - - - - - - - - -			
β(EST - PRE)	1.0540	3.3499	0.3146
β(EST - POST)	0.5010	3.4408	0.1456
β(PRE - POST)	-0.5530	0.0909	-6.0836*

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R^2 = .2224   Number of Observations = 254
DW = 1.9540   Degrees of Freedom = 240

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.11
INTERVENTION ANALYSIS--CP ENTERPRISES

MODEL: AR(4) AT LAGS 4,8,26,38
MA(3) AT LAGS 7,21,27

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0115	0.0075	1.5381[1]
AR(LAG 4)	-0.1436	0.0594	-2.4201[4]
AR(LAG 8)	0.1293	0.0592	2.1852[3]
AR(LAG 26)	-0.1138	0.0591	-1.9203[2]
AR(LAG 38)	-0.1067	0.0576	-1.8516[2]
β(EST)	-0.1684	0.9120	-0.1847
β(PRE)	0.2400	0.1817	1.3213[1]
β(POST)	0.9312	0.1862	5.0019*
ξ_1	-0.0102	0.0077	-1.3172[1]
ξ_2	-0.0124	0.0078	-1.5507[1]
MA(LAG 7)	0.1122	0.0638	1.7600[2]
MA(LAG 21)	-0.1146	0.0653	-1.7543[2]
MA(LAG 27)	0.1120	0.0656	1.7073[2]

β(EST - PRE)	-0.4084	0.7303	-0.5592
β(EST - POST)	-1.0996	0.7258	-1.5150[1]
β(PRE - POST)	-0.6912	0.0045	-153.6000*

R^2 = .2041 Number of Observations = 261
DW = 1.9500 Degrees of Freedom = 248

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.12
INTERVENTION ANALYSIS--GENSTAR

MODEL:　　AR(9) AT LAGS 1,2,10,12,23,26,31,48
　　　　　MA(2) AT LAGS 3,18

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.1545	0.0599	0.2580
AR(LAG 1)	-0.1708	0.0664	-2.5720[4]
AR(LAG 2)	-0.0824	0.0678	-1.2154
AR(LAG 10)	0.1737	0.6645	2.6141*
AR(LAG 12)	-0.1104	0.0663	-1.6643[2]
AR(LAG 23)	-0.1088	0.0651	-1.6703[2]
AR(LAG 26)	-0.1087	0.0655	-1.6604[2]
AR(LAG 31)	-0.1196	0.6469	-1.8487[2]
AR(LAG 48)	-0.0887	0.0676	-1.3129[1]
β(EST)	3.9147	6.2752	0.6238
β(PRE)	0.0944	0.1413	0.6678
β(POST)	0.3188	0.3150	1.0122
ξ_1	-0.0167	0.0599	-0.2783
ξ_2	-0.0159	0.0599	-0.2660
MA(LAG 3)	-0.1112	0.0710	-1.5677[1]
MA(LAG 18)	0.0854	0.0728	1.1733

β(EST - PRE)	3.8204	6.1339	0.6228
β(EST - POST)	3.5959	5.9602	0.6033
β(PRE - POST)	-0.2244	0.1737	-1.2919[1]

R^2 = 0.1539　　Number of Observations = 223
DW = 2.0180　　Degrees of Freedom = 207

Significance:　(*)　significant at .005
　　　　　　　(1)　significant at .100
　　　　　　　(2)　significant at .050
　　　　　　　(3)　significant at .025
　　　　　　　(4)　significant at .010

TABLE 7.13
INTERVENTION ANALYSIS--INTERCITY OIL AND GAS

MODEL:　　AR(3) AT LAGS 1,4,9
　　　　　MA(2) AT LAGS 7,11

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	-0.0009	0.0024	-0.3722
AR(LAG 1)	-0.0679	0.0558	-1.2173
AR(LAG 4)	-0.1308	0.0559	-2.3368[4]
β(EST)	1.1434	0.5401	2.1170[3]
β(PRE)	0.2417	0.2655	0.9103
β(POST)	0.6324	0.1508	4.1929[*]
ξ_1	0.0030	0.0028	1.0454
ξ_2	0.0018	0.0027	0.6706
MA(LAG 7)	-0.1126	0.0595	-1.8940[2]
MA(LAG 11)	-0.1391	0.0599	-2.3207[3]

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β(EST - PRE)	1.1717	0.2746	4.2669[*]
β(EST - POST)	0.5109	0.3893	1.3124[1]
β(PRE - POST)	-0.3907	0.1147	-3.4063[*]

- - - - - - - - - - - - - -

R^2 ＝　.1283　　Number of Observations ＝ 290
DW ＝　2.1000　　Degrees of Freedom ＝ 279

Significance:　(*)　significant at .005
　　　　　　　(1)　significant at .100
　　　　　　　(2)　significant at .050
　　　　　　　(3)　significant at .025
　　　　　　　(4)　significant at .010

TABLE 7.14
INTERVENTION ANALYSIS--PLACER DEVELOPMENT

MODEL: AR(4) AT LAGS 1,10,21,37
        MA(4) AT LAGS 5,8,12,42

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0049	0.0053	0.9213
AR(LAG 1)	-0.0923	0.0617	-1.4974[1]
AR(LAG 10)	0.0948	0.0597	1.5884[1]
AR(LAG 21)	-0.0782	0.0604	-1.2942[1]
AR(LAG 37)	0.1155	0.0597	1.9342[2]
β(EST)	0.2042	1.5970	0.1279
β(PRE)	0.4033	0.3573	1.1288
β(POST)	0.9274	0.1236	7.5044*
ξ_1	-0.0039	0.0055	-0.7129
ξ_2	-0.0047	0.0055	-0.8481
MA(LAG 5)	-0.1076	0.0692	-1.5548[1]
MA(LAG 8)	-0.1116	0.0699	-1.5965[1]
MA(LAG 12)	-0.1224	0.0721	-1.6989[2]
MA(LAG 42)	0.1798	0.0744	2.4172[4]
. . . .			
β(EST - PRE)	-0.1991	1.2397	-0.1606
β(EST - POST)	-0.7232	1.4734	-0.4908
β(PRE - POST)	-0.5241	0.2337	-2.2426[3]

. . . .

R^2 = .3266   Number of Observations = 212
DW = 1.9886   Degrees of Freedom = 198

Significance: (*) significant at .005
               (1) significant at .100
               (2) significant at .050
               (3) significant at .025
               (4) significant at .010

TABLE 7.15
INTERVENTION ANALYSIS--MACMILLAN BLOEDEL

MODEL: AR(1) AT LAG 2
MA(4) AT LAGS 27,31,32,46

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0030	0.0025	1.2340
AR(LAG 2)	0.0922	0.0545	1.6912[2]
β(EST)	-0.1518	0.3569	-0.4252
β(PRE)	0.7747	0.1751	4.4231*
β(POST)	0.8249	0.1431	5.7637*
ξ_1	-0.0031	0.0029	-1.0737
ξ_2	-0.0031	0.0029	-1.0789
MA(LAG 27)	-0.0928	0.0600	-1.5467[1]
MA(LAG 31)	0.0727	0.0603	1.2053
MA(LAG 32)	0.1313	0.0610	2.1744[3]
MA(LAG 46)	-0.1322	0.0620	-2.1325[3]
- - - - - - - - - - - - -			
β(EST - PRE)	-0.9265	0.1818	-5.0960*
β(EST - POST)	-0.9767	0.2138	-4.5683*
β(PRE - POST)	-0.0502	0.0320	-1.5690[1]

R^2 = .1855   Number of Observations = 297
DW = 1.9100   Degrees of Freedom = 282

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.16
INTERVENTION ANALYSIS--MOORE CORPORATION

MODEL: MA(5) AT LAGS 2,6,17,23,35

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	-0.0011	0.0019	-0.6077
β(EST)	0.6057	0.1109	5.4599*
β(PRE)	0.4609	0.0993	4.6395*
β(POST)	0.5053	0.9457	5.3428*
ξ_1	0.0008	0.0023	0.3703
ξ_2	0.0024	0.0023	1.0398
MA(LAG 2)	0.1634	0.0577	2.8334*
MA(LAG 6)	0.1117	0.0574	1.9464[3]
MA(LAG 17)	0.1080	0.5867	1.8406[2]
MA(LAG 23)	0.0917	0.0591	1.5514[1]
MA(LAG 35)	-0.1524	0.5963	-2.5552[4]

β(EST - PRE)	0.1448	0.0116	12.4830*
β(EST - POST)	0.1004	0.0163	6.1596*
β(PRE - POST)	-0.0043	0.0152	-2.9140*

R^2 = .2586   Number of Observations = 299
DW = 2.0720   Degrees of Freedom = 288

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.17
INTERVENTION ANALYSIS--MASSEY FERGUSON

__MODEL__: MA(3) AT LAG 34,54,63

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0022	0.0021	1.0560
β(EST)	-0.6772	0.3601	-1.8809[2]
β(PRE)	-0.3364	0.3777	-0.8907
β(POST)	1.3635	0.1775	7.6832*
ξ_1	-0.0018	0.0025	-0.7082
ξ_2	-0.0018	0.0024	-0.7590
MA(LAG 34)	-0.1412	0.0616	-2.2917[3]
MA(LAG 54)	-0.1486	0.0636	-2.3361[4]
MA(LAG 63)	0.1050	0.0644	1.6304[1]

β(EST - PRE)	-0.3408	0.0176	-19.3636*
β(EST - POST)	-2.0407	0.1826	-11.1758*
β(PRE - POST)	-1.6999	0.2002	-8.4910*

R^2 = .2126   Number of Observations = 299
DW = 1.8685   Degrees of Freedom = 290

Significance: (*) significant at .005
               (1) significant at .100
               (2) significant at .050
               (3) significant at .025
               (4) significant at .010

TABLE 7.18
INTERVENTION ANALYSIS--NORTHERN TELECOM

MODEL: MA(2) AT LAGS 2,8

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	0.0012	0.0024	0.5174
β(EST)	0.3963	0.2250	1.7618[2]
β(PRE)	0.3428	0.1583	2.1660[3]
β(POST)	0.7459	0.1759	4.2403*
ξ_1	-0.0007	0.0028	-0.8555
ξ_2	0.0018	0.0028	2.0308[3]
MA(LAG 2)	0.1181	0.0582	2.0308[3]
MA(LAG 8)	-0.1091	0.0589	-1.8537[2]
- - - - - - - - - - - - -			
β(EST - PRE)	0.0535	0.0667	0.8021
β(EST - POST)	-0.3496	0.0491	-7.1202*
β(PRE - POST)	-0.4031	0.0176	-22.9000*

R^2 = .1660   Number of Observations = 301
DW = 2.0250   Degrees of Freedom = 293

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.19
INTERVENTION ANALYSIS--TEXACO CANADA

MODEL: MA(4) AT LAGS 1,2,13,27

VARIABLE	COEFFICIENT	STANDARD ERROR	T STATISTIC
CONSTANT	-0.0005	0.0031	-0.1523
$\beta(EST)$	0.3560	0.4180	0.8516
$\beta(PRE)$	0.2619	0.1940	1.3498[1]
$\beta(POST)$	1.0813	0.2057	5.2566*
ξ_1	0.0040	0.0037	1.0675
ξ_2	-0.0021	0.0036	-0.5668
MA(LAG 1)	0.1244	0.0591	2.1057[3]
MA(LAG 2)	-0.0555	0.0586	-0.9473
MA(LAG 13)	-0.1042	0.0588	-1.7718[2]
MA(LAG 27)	-0.1342	0.6074	-2.2100[3]
- - - - - - - - - - - -			
$\beta(EST - PRE)$	0.0941	0.2240	0.4201
$\beta(EST - POST)$	-0.7252	0.2123	-3.4160*
$\beta(PRE - POST)$	-0.8194	0.0117	-70.0300*

R^2 = .1349   Number of Observations = 297
DW = 1.9898   Degrees of Freedom = 287

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.20
INTERVENTION ANALYSIS - CHIEFTAIN DEVELOPMENT

MODEL: AR(3) AT LAGS 1,2,3
MA(2) AT LAGS 23,29

VARIABLE	COEFFICIENT	STANDARD-ERROR	T STATISTIC
CONSTANT	-0.0015	0.0052	-0.2943
AR(LAG 1)	-0.1156	0.0555	-2.0835[3]
AR(LAG 2)	-0.0766	0.0557	-1.3761[1]
AR(LAG 3)	-0.0640	0.5574	-1.1477
β(EST)	1.4582	0.3328	4.3816[*]
β(PRE)	1.1353	0.2804	4.0484[*]
β(POST)	1.0667	0.3808	2.8015[*]
ξ_1	0.0053	0.6367	0.8260
ξ_2	0.0022	0.0061	0.3729
MA(LAG 23)	-0.1299	0.0615	-2.1101[3]
MA(LAG 29)	-0.1068	0.0628	-1.7019[2]
β(EST - PRE)	0.3230	0.0524	6.1640[*]
β(EST - POST)	0.3915	0.0480	8.1560[*]
β(PRE - POST)	0.0685	0.1004	0.6822

R^2 ~ .1712   Number of Observations = 296
DW = 2.1040   Degrees of Freedom = 285

Significance: (*) significant at .005
(1) significant at .100
(2) significant at .050
(3) significant at .025
(4) significant at .010

TABLE 7.21
INTERVENTION ANALYSIS--NORTHGATE EXPLORATION

__MODEL__: MA(5) AT LAGS 1,4,7,8;45

CONSTANT	-0.0016	0.0021	-0.7890
β(EST)	1.2964	0.7291	1.7780[2]
β(PRE)	0.6380	0.2928	2.1789[3]
β(POST)	1.1146	0.1667	6.8730*
ξ_1	0.0043	0.0025	1.7364[2]
ξ_2	0.0000	0.0023	0.0052
MA(LAG 1)	-0.1419	0.0589	-2.4067[4]
MA(LAG 4)	-0.1363	0.0590	-2.3090[4]
MA(LAG 7)	-0.1737	0.0591	-2.9362*
MA(LAG 8)	-0.1045	0.0603	-1.7335[2]
MA(LAG 45)	-0.1638	0.0661	-2.4796[4]

β(EST - PRE)	0.6584	0.4363	1.5091[1]
β(EST - POST)	0.1819	0.5624	0:3234
β(PRE - POST)	-0.4766	0.1261	-3.7795*

R^2 = .2049   Number of Observations = 291
DW = 1.9298   Degrees of Freedom = 280

Significance: (*) significant at .005
              (1) significant at .100
              (2) significant at .050
              (3) significant at .025
              (4) significant at .010

To conclude the study of the market's assessment of the interlisting event it is noteworthy to review the principle conclusions which were reached in the present research. The conventional event study methodology found evidence of significant positive abnormal returns surrounding the interlisting event. However, it was argued that rather than accept the conclusion of market inefficiency, a reason should be sought which could explain such returns and thus show them to be consistent with market efficiency. To that end intervention analysis was employed. Once possible autocorrelation in residuals had been removed and shifts in systematic risk accounted for, abnormal returns did not persist in over half of the firms included in the sample. For those firms in which the coefficient on the intervention dummy was significant, moreover, high critical t values were not used. Thus the evidence obtained by use of the more robust intervention analysis methodology failed to lend strong support to the proposition that abnormal returns could be earned by transacting in firms about to internationally interlist or those that have actually done so.

7.4 SWITCHING REGRESSION ANALYSIS

At this point attention is focused more closely on the systematic risk pattern of interlisted firms. It was argued that systematic risk should first rise, and then decline as the firm moves through the interlisting life cycle. While intervention analysis appears to bear out the hypothesized increases in systematic risk, the period of plus or minus one hundred days surrounding the interlisting date is probably too short to assess whether decreases in systematic risk occur following interlisting. In order to investigate more thoroughly the changes in systematic risk which potentially may occur, the technique of switching regressions is employed.

Prior to outlining the technique of switching regressions it is useful to consider the issue of which proxy should be used to measure the ex-post returns on the market portfolio. Reference was made earlier to the possibility that thin trading on the TSE may produce biased estimates of beta. For purely statistical reasons, that is measurement error, beta may increase following interlisting as a result of attenuation of the thin trading bias. The results obtained from the use of intervention analysis also considered this argument as a possible explanation for the observed increases in systematic risk. While relative to the U.S. market portfolio firms in the pre-interlisted class may be illiquid, when the reference point of the Canadian market portfolio is used thin trading may not be the case. Nevertheless, following interlisting, trading may be more frequent relative to the TSE index and th there is a possibility of over-estimation of systematic risk. On the other hand, if the U.S. market portfolio replaces the

Canadian market portfolio, the reverse argument may hold prior to interlisting and therefore increases in systematic risk might also be observed following interlisting. Furthermore, if international interlisting causes the firm to be priced internationally, rather than nationally, it is not possible to test the hypothesis using competing market models which employ different market indices.[55] To partially resolve these difficulties two separate empirical techniques were employed. Switching regressions which employ the monthly return on the TSE index are used to investigate the hypothesis that a switch in the regression relationship has occurred following interlisting. The use of monthly data rather than daily data allows a longer estimation period to be used. Since switching regressions require the estimation of twice as many linear regressions as there are observations it would not be practical to consider switching on a daily basis for a period of longer than six months of daily returns. Such a shorter period surrounding the event date would thus preclude the possibility that a switch occurred in the regression relationship at longer lag times. In addition, intervention analysis was in part used to eliminate the problem of non-normality in daily returns. Monthly returns, on the other hand, appear to be normally distributed as discussed by Brown and Warner (1980).

Intervention analysis employing the return on the U.S. market portfolio proxied by the return on the NYSE was used to investigate the market's response to the event of interlisting. As described earlier, in

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[55]This point is further explained in Chapter Three. Basically, tests of the market segmentation hypothesis have been powerless to infer market structure when competing asset pricing models are employed.

this chapter, intervention analysis also permits shifts in beta to occur during the pre and post event period. Unless the thin trading problem is extremely severe, the predicted direction of beta coefficients should be the same regardless of the market portfolio used.

Formally, estimation of switching regressions proceeds as follows. The null hypothesis which is tested is that no switch in regression regimes has occurred. The alternative hypothesis is that the observations were generated by two or more distinct regimes. Monthly returns adjusted for dividends for the interlisted firms will be obtained from the Laval Data Tape for the period of twenty-four months prior to interlisting and forty-eight months following the event. The longer period following the interlisting date allows the possibility to observe the hypothesized decreases in systematic risk which could not be uncovered by the shorter time period used in the conduct of intervention analysis. Brown, Lockwood, and Lummer (1985) in their use of the switching regression technique point out another advantage of this method over conventional event studies. Like intervention analysis, switching analysis permits firms to be studied on a case by case basis. Furthermore, however, they note that switching regression analysis does not require arbitrary imposition of the event date. This could be an important attribute in the study of the interlisting phenomenon since if interlisted firms have their prices even partially determined by the U.S. market following interlisting, it is unlikely that the adjustment would be coincident with the event itself. In essence, switching regression analysis admits the possibility that the market response to events of consequence may occur at varying lags following the event in

question, depending upon the nature of the event, its actual date, and the firm itself.

The market index used in the switching regression analysis will be the value weighted TSE index obtained from the same source. Risk free rates of interest are obtained from the Bank of Canada Review which publishes yields on three month Treasury Bills.

Equation (7.12) is assumed to hold for all observations up to the time, (t^*), when the switch occurs; and equation (7.13) is assumed to hold for remainder of the observations, that is (t^*+1) to (T), the final observation in the sample.

(7.12) $R_j = \alpha_1 + \beta_1 R_m + u_{1j}$

(7.13) $R_j = \alpha_2 + \beta_2 R_m + u_{2j}$

where: R_j = the monthly excess return on the interlisted firm

R_m = the monthly excess return on the TSE index

In estimation of the switch point (t^*), which is unknown, the log of the likelihood function over all observations, (t) to (T) is first calculated. Subsequently the log of the likelihood function is estimated on successive partitions of the observations implying that (t^*) first equals observation three, then four and so on. In empirical analysis, it will be assumed that (t^*) first equals observation five and thus the calculations of the log of the likelihood function will proceed on observations one to five and six to seventy-three. At the other end of the paired observations it will be assumed that (t^*) occurs at observation sixty-eight, and thus the calculations of the log of the likelihood function will proceed on observations one to sixty-eight, and

sixty-nine to seventy-three. The probability that the switch point occurs at (t^*) is given by (λ) defined below as:

(7.14) $\quad \lambda = \text{Log}[(\text{Max likelihood of the observations given } H_0)/(\text{Max likelihood of observations given } H_1)]$

The minimum value obtained in (7.14) may be where the switch point in the regression regimes occurs although no statistical test to support this hypothesis exists. Nevertheless plotting (λ) against time, (t), to visually observe the minimum can still be instructive. This procedure was used by Mehta and Beranek (1982) in an analysis of stock returns for AT&T data. In addition they propose a more robust method which permits not only the location of the switch points but the number, unlike the Quandt technique which theoretically permits only one switch to be identified. Interestingly, their more complicated procedure did not produce results that differed substantively from using the simpler plots of (λ).

In summary, the switching regression approach yields results which bear not only upon the issue of capital market integration but also upon the potential risk reduction benefits often associated with the listing phenomenon. Analysis is carried out on a firm by firm basis using a sample which consists of interlisted firms between 1964 and 1980. Due to data availability considerations and the desirability of having a forty-eight month period following the interlisting date, the sample of firms for which estimation of the switching regressions are carried out is limited to eleven firms as follows: Northgate Exploration, Numac Oil and Gas, United Westburne International, Chieftain Development, Massey Ferguson, Total Petroleum, Placer

Development, Intercity Gas, Genstar, Northern Telecom and Page Petroleum. The graphs of lambda begin on page 178.

Inspection of Graphs IV through XIV, reveal that the switch point occurs well after the month of interlisting. The shortest switch point observed occurred at six months following interlisting in the case of Intercity. Also, both Northern Telecom and United Westburne International show signs of switching at eight months following interlisting. For the other firms in the sample the switch point occurred from about year and a half to about three years following the interlisting month. For convenience the switch month is tabulated in Table 7.22 which follows.

TABLE 7.22

SWITCH POINTS

COMPANY	SWITCH POINT
NORTHGATE	32 MONTHS AFTER INTERLISTING
NUMAC	36 MONTHS AFTER INTERLISTING
UNITED WESTBURNE INT.	8 MONTHS AFTER INTERLISTING
CHIEFTAIN DEVELOPMENT	36 MONTHS AFTER INTERLISTING
MASSEY FERGUSON	18 MONTHS AFTER INTERLISTING
TOTAL PETROLEUM	11 MONTHS AFTER INTERLISTING
INTERCITY GAS	6 MONTHS AFTER INTERLISTING
GENSTAR CORPORATION	17 MONTHS AFTER INTERLISTING
PAGE PETROLEUM	36 MONTHS AFTER INTERLISTING
NORTHERN TELECOM	8 MONTHS AFTER INTERLISTING
PLACER DEVELOPMENT	28 MONTHS AFTER INTERLISTING

TABLE 7.23
SYSTEMATIC RISK ESTIMATES

COMPANY	-24 MO.	+24 MO.	-SWITCH	+SWITCH
PLACER				
ALPHA	-.013	.013	.020[1]	.026
BETA	.775[2]	1.261*	1.446*	.762
TOTAL				
ALPHA	-.025	-.025	-.040	-.038[2]
BETA	-.051	.144	-.141	.189
GENSTAR				
ALPHA	-.041	-.062[3]	-.073*	-.020
BETA	.158	-.585	-.269	.033
CHIEFTAIN				
ALPHA	.095*	-.038	.065[4]	.262[2]
BETA	2.154*	.231	1.653*	3.182[4]
NUMAC				
ALPHA	.043[1]	.050[2]	.060*	.014
BETA	1.370*	1.763*	1.838*	1.306*
MASSEY				
ALPHA	-.018	-.006	.013	-.018
BETA	.798[3]	1.336*	1.349*	.798[3]
INTERCITY				
ALPHA	.004	.038	.003	.032
BETA	.931[4]	1.298[4]	.945*	1.236*
PAGE PETROLEUM				
ALPHA	.096[2]	.144[2]	.094[3]	-.142*
BETA	1.682*	2.030*	1.760*	.347
NORTHGATE				
ALPHA	-.022	-.032[1]	-.028[2]	.043
BETA	.2762	1.409*	.647[3]	1.256[1]
NORTHERN TELECOM				
ALPHA	.033	.023	.024	.006
BETA	1.021*	1.853*	1.035*	1.124*
UNITED WESTBURNE INTERNATIONAL				
ALPHA	-.042	0.002	-.033	-.038
BETA	.199	.931[2]	.368	.553[2]

* Significant at .005   1 Significant at .100
2 Significant at .05   3 Significant at .025   4 Significant at .010

The results of the switching regression were further analyzed by computing the parameters of the ordinary least squares model for the period of plus/minus twenty-four months surrounding the interlisting month, and the period prior to and following the switch point identified in the switching regressions which varied from firm to firm. No comparison of the results of the different estimation periods is intended. Rather the parameters of the regression model for the period plus/minus twenty-four months surrounding the interlisting month are included since that might be a natural partition in the sample if the switching technique had not been employed. These results are tabulated in Table 7.23, above. An examination of the parameters of the regression model calculated before and after the switch point tends to confirm the results obtained using intervention analysis. For the most part risk rose in the twenty-four month period following the interlisting month as compared to the twenty-four month immediately preceding the interlisting months. These results are generally upheld when systematic risk is examined in the pre and post switch period. With the exception of Placer Development, Numac, Massey Ferguson, and Page Petroleum, systematic risk rose following the switch point. In any case since the period examined in the switching regression is of much longer duration than that used in the intervention analysis, both for twenty-four months following interlisting as well as for the period following the switch point, the risk parameters which were estimated tend to confirm the findings of the interlisting life cycle in that the increased riskiness of firms during the mature interlisted phase as compared to the pre-interlisting stage of their development is frequently translated into increased systematic

risk. Finally, for some firms, there is evidence of the predicted
decline in systematic risk at long lags following the event date.

GRAPH XV
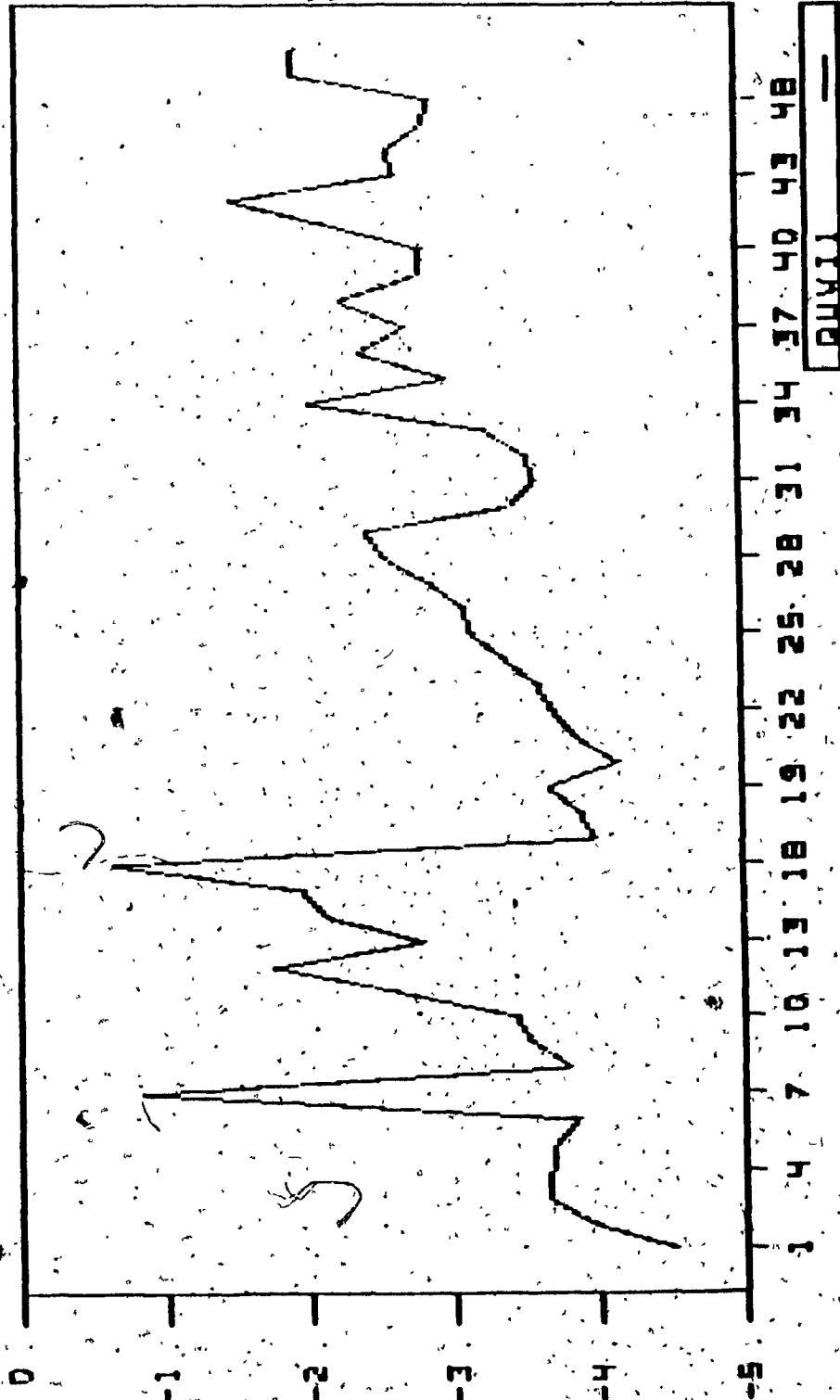
SWITCH POINT--NORTHGATE EXPLORATION
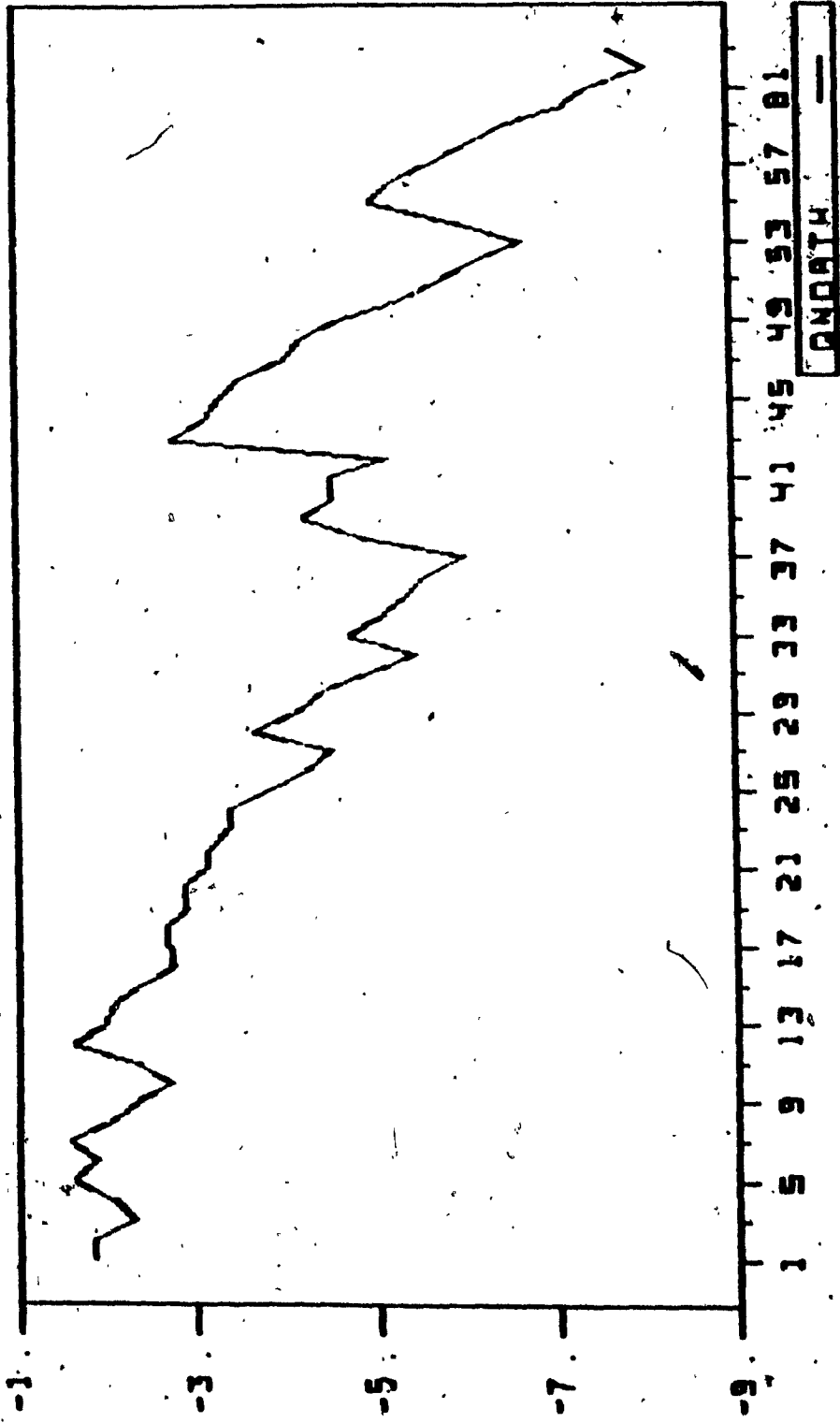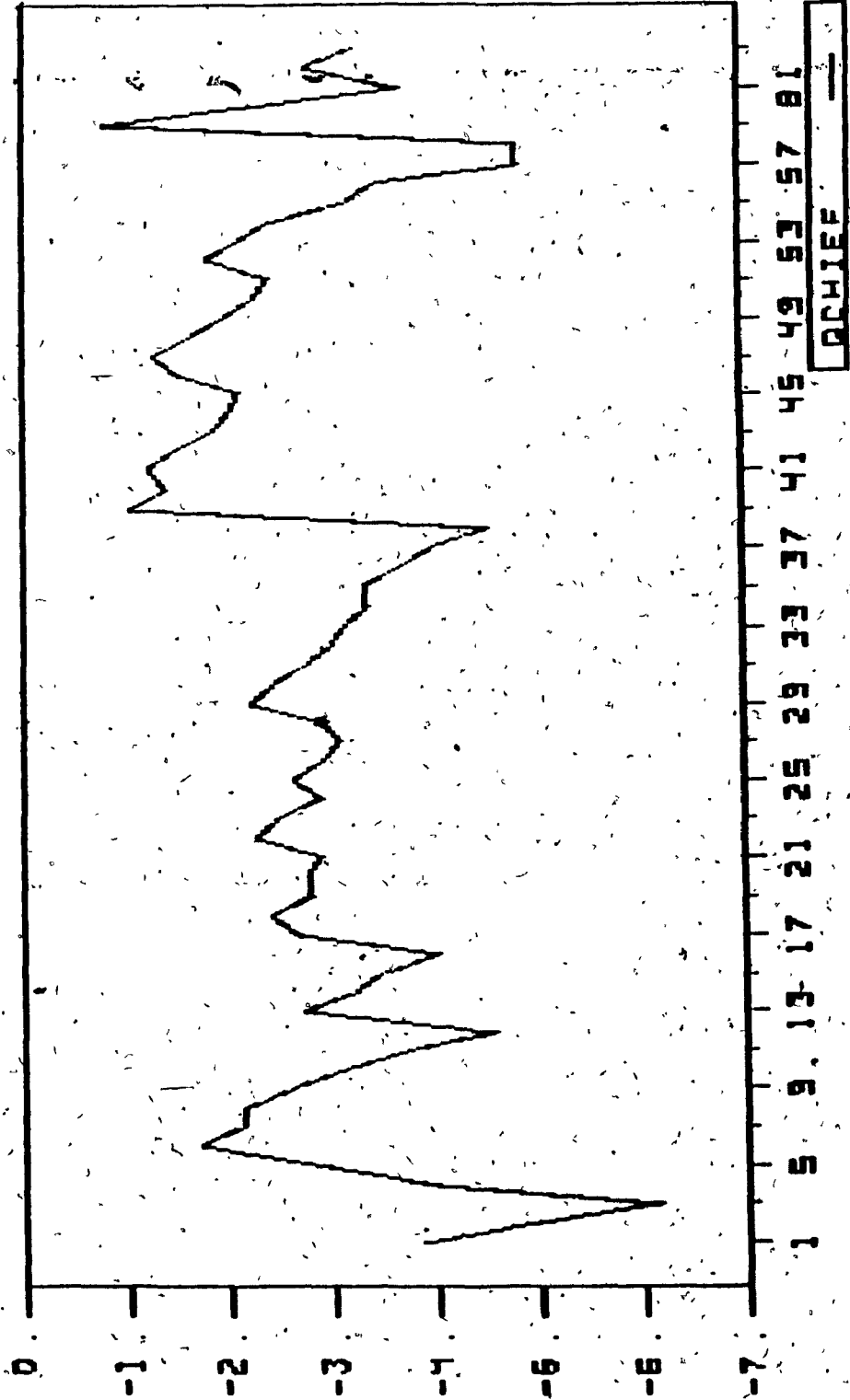
GRAPH V

SWITCH POINT--NUMAC OIL & GAS
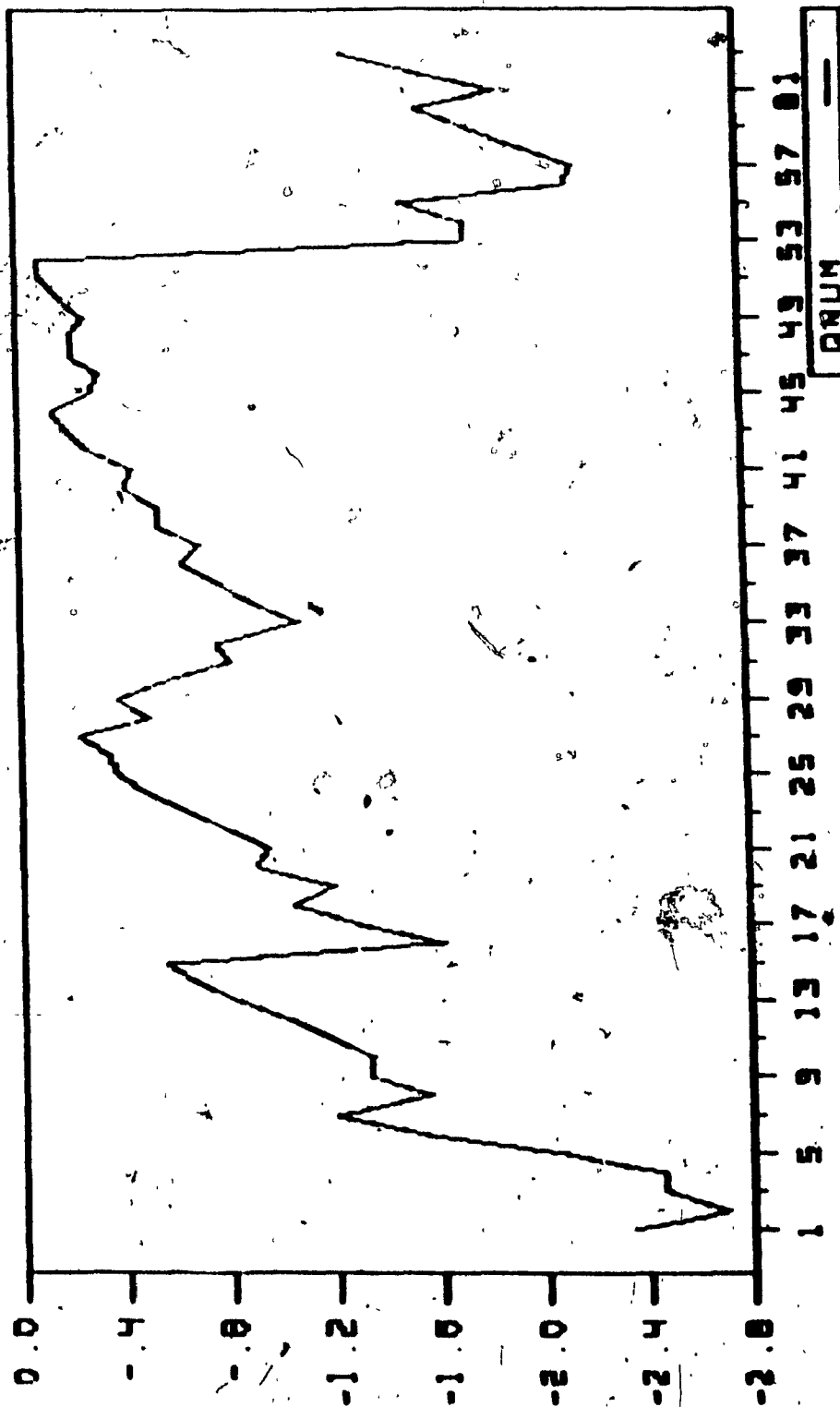
GRAPH VI

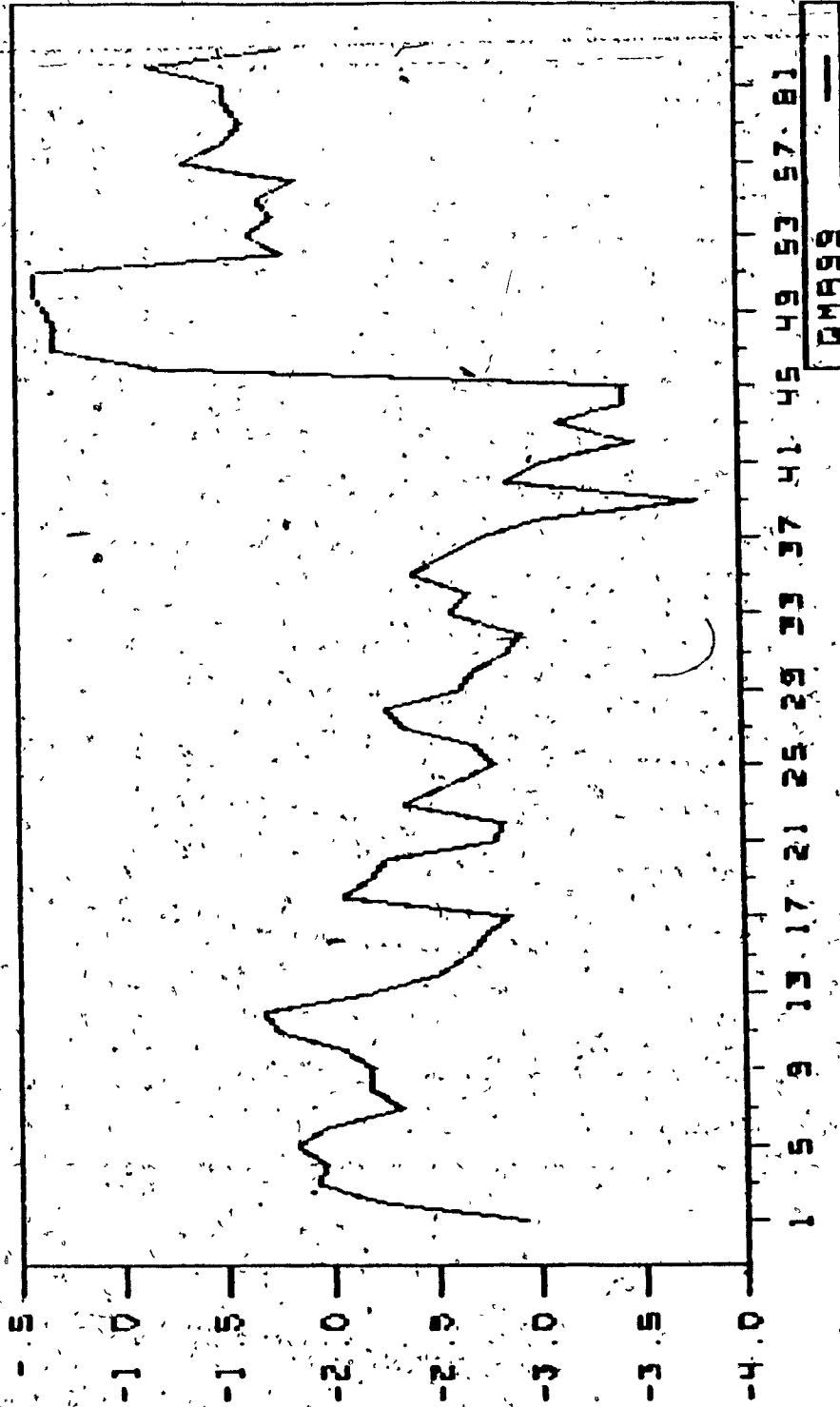## SWITCH POINT--UNITED WESTBURNE INTERNATIONAL

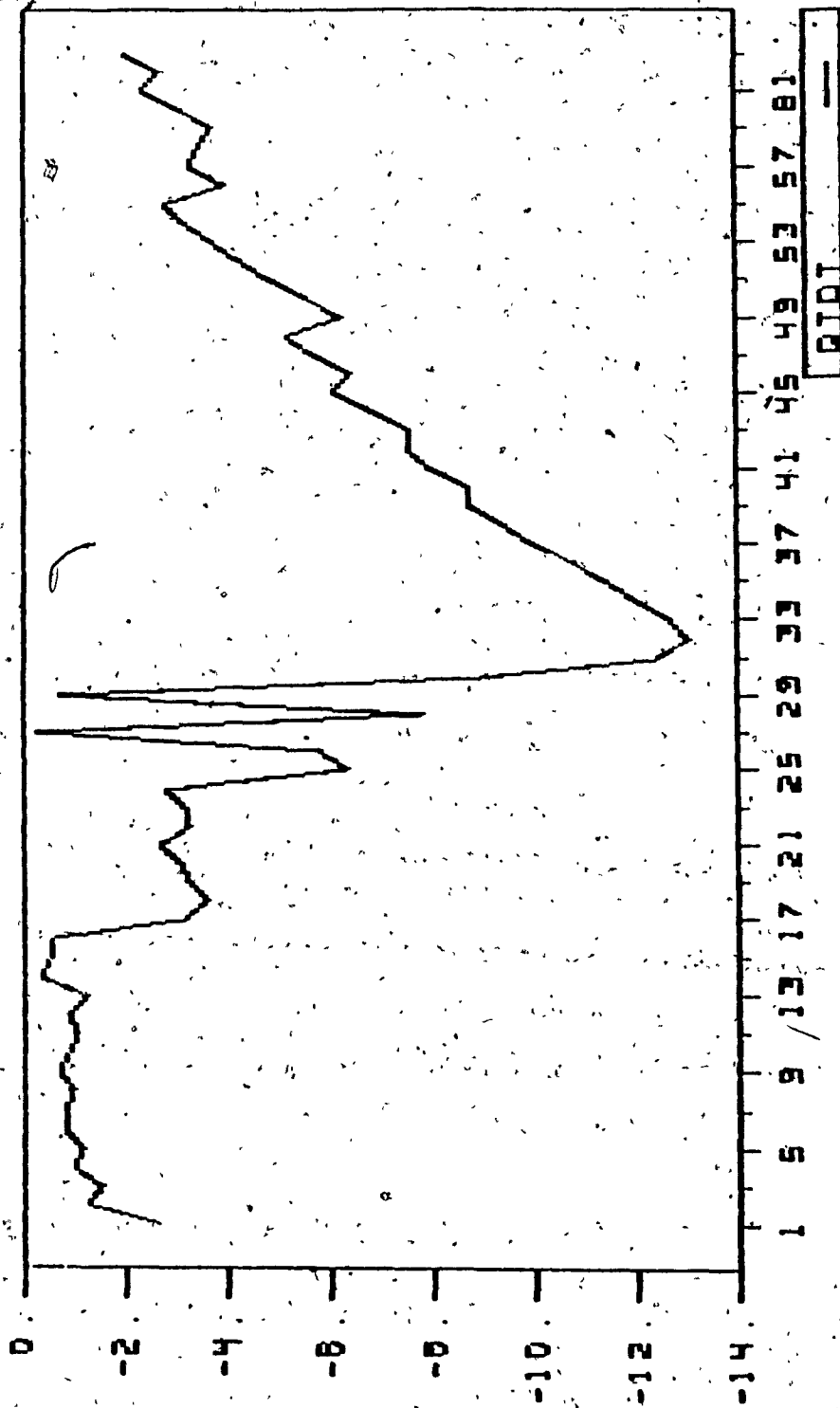182

GRAPH VII

SWITCH POINT--CHIEFTAIN DEVELOPMENT
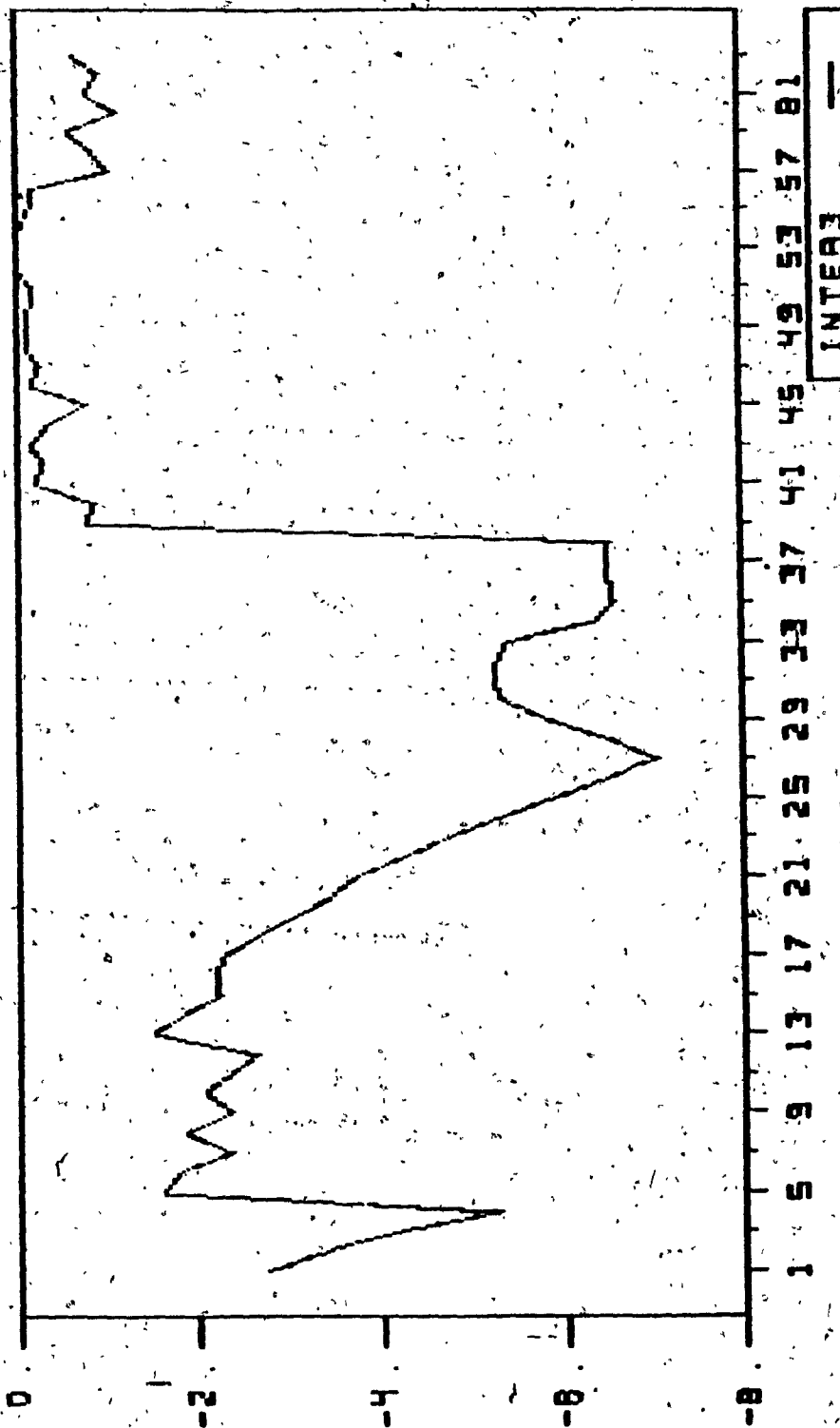
GRAPH VIII

SWITCH POINT--MASSEY FERGUSON
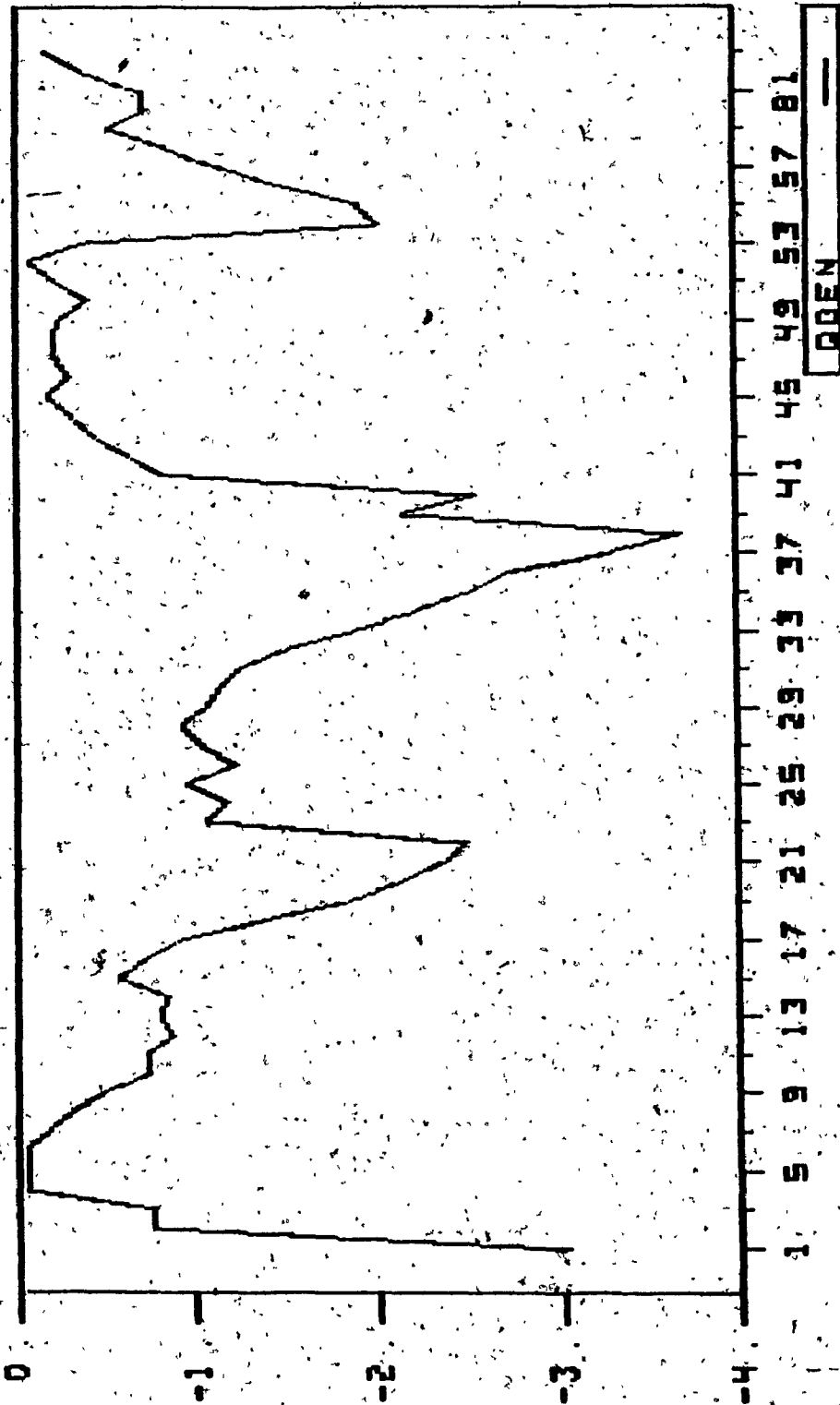
GRAPH IX

SWITCH POINT--TOTAL PETROLEUM

GRAPH X

SWITCH POINT--INTERCITY OIL & GAS

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GRAPH XI

SWITCH POINT--GENSTAR

GRAPH XII

SWITCH POINT--PAGE PETROLEUM

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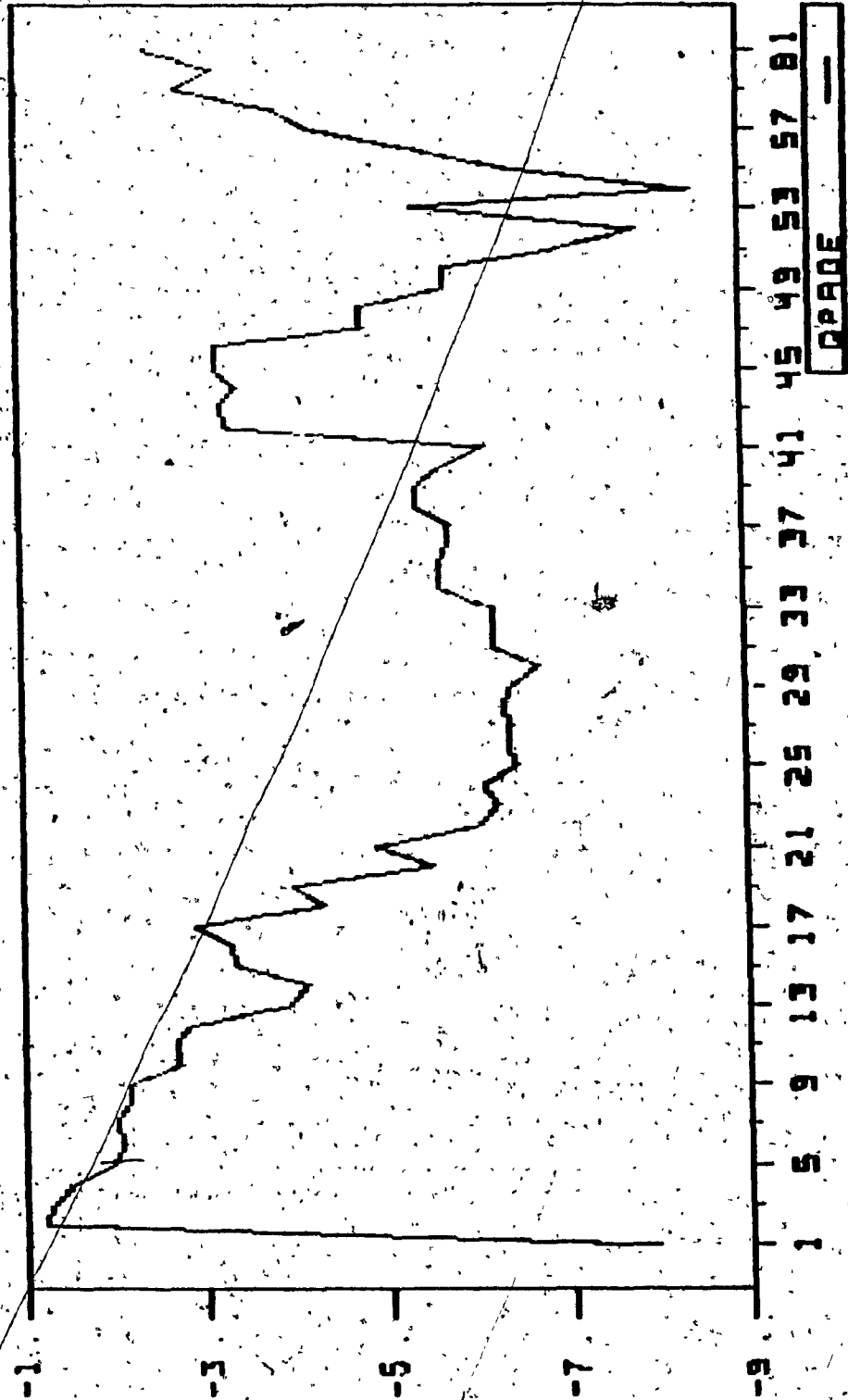
GRAPH XIII

SWITCH POINT--NORTHERN TELECOM
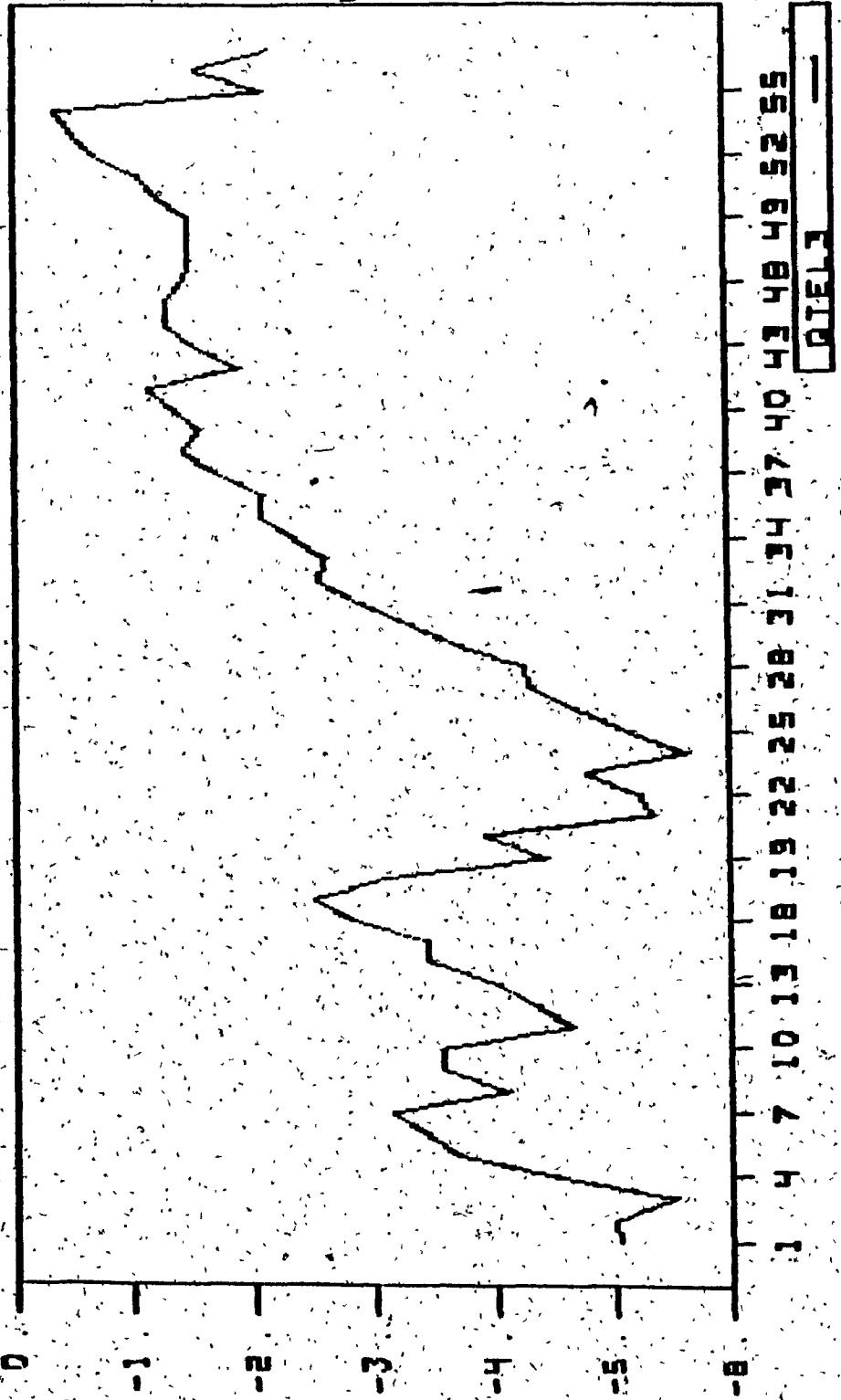
GRAPH XIV

SWITCH POINT--PLACER DEVELOPMENT
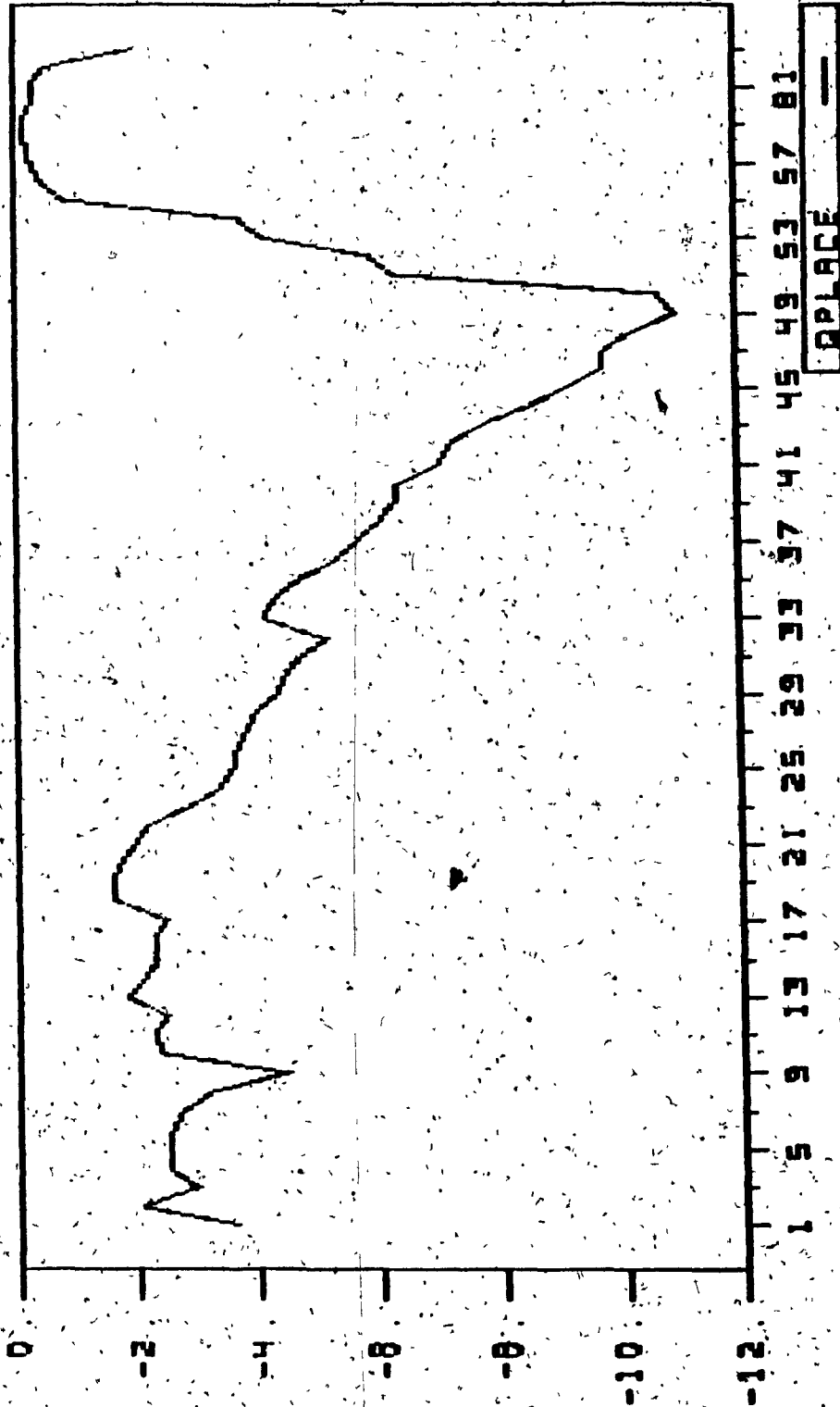
7.5: SUMMARY

The major thrust of the empirical research in this chapter revolved about the investigation of the market response to the event of international interlisting. In this regard, the risk-return relationship of the firms was analyzed on a case by case basis, employing the techniques of switching regressions and intervention analysis. The results obtained were compared to those yielded by the more conventional event study approach. As anticipated, the conventional approach yielded significant average residuals and cumulative average residuals. These findings, it was argued, should be viewed in light of the possible changes in systematic risk occurring concomitant with international interlisting. Abnormal returns which were detected would then be viewed as reflecting the greater compensation demanded by investors for holding firms over a riskier period in their evolution. In general, except at relatively low levels of significance, abnormal returns were not detected when intervention analysis replaced conventional event study methodology. Equally important, however, was the finding that international interlisting appears to be accompanied by increases in systematic risk, a result that was also predicted using the interlisting life cycle approach and which was supported both by the intervention analysis as well as the switching regression approach.

CHAPTER EIGHT
CONCLUSIONS

In this dissertation the consequences of international interlisting were analyzed using a variety of methodological approaches. A descriptive interlisting life cycle framework was developed to analyze the interlisting phenomenon which did prove effective as a conceptual tool in examining the issues surrounding international interlisting.

The results provided by the multinomial logit analysis lent strong empirical support to the argument that international interlisting could usefully be viewed within the context of an interlisting life cycle. In particular, firms appeared to indeed interlist at a robust stage in their development which was exemplified by heightened profitability during this stage. This fact, alone, could cause share price increases in an efficient market. Increased risk, however, also appeared to accompany the currently interlisting phase of evolution. A conventional event study, as of the type carried out in this dissertation, provided evidence of abnormal returns and hence market inefficiency. However, once changes in risk were accounted for, such abnormal returns dissipated. It was found that during the currently interlisting period, capital expenditure rose. To the extent then that the market anticipated future profitable capital expenditure following interlisting, positive excess returns are again consistent with market efficiency. During the pre-interlisting stage and the currently interlisting stage, it was argued that firms would rely more extensively upon internal sources of financing to fuel capital expenditure requirements and only when entrenched upon the foreign exchange would a

more generous dividend policy be observed. As discussed more fully elsewhere in this dissertation, the impact of an increase in dividends upon share prices is difficult to assess due to the rather large amount of conflicting evidence available. In some studies, nevertheless, share prices appear to react favorably to increases in dividends. At the very least, increases in dividend payout are not anticipated to depress stock prices. Thus abnormal returns could occur in part due to the market's assessment of future higher dividends and hence again be consistent with market efficiency. In summary, then, the results of the multinomial logit analysis taken together with those obtained using simpler descriptive statistics appear to point to conventionally measured excess returns being consistent with market efficiency. Nevertheless, it is not necessarily the case that the absence of abnormal returns would indicate market inefficiency. Increases in systematic risk during the event period might overwhelm other factors and consequently produce conventionally measured abnormal returns.

The issue of the changing risk profile of the firm was directly addressed in this dissertation. As discussed above, evidence was uncovered of heightened total risk during the interlisting period. The intervention analysis methodology employed in this research confirmed that the heightened total risk also translated into increased systematic risk during the event period. Nevertheless, purely statistical phenomena may also have contributed to the observed increases in systematic risk. Given the evidence regarding the relationship between international interlisting and liquidity which was provided by Taylor [1986] and also the results of the present research that found important increases in

liquidity following interlisting, increases in systematic risk may have occurred as a result of an attenuation of the thin trading bias. This is not considered to be the sole explanation for increased risk. Total risk was observed to increase during the currently interlisting phase of the interlisting life cycle. Furthermore, Kalay and Lowenstein [1985] provided corroborating evidence with regard to increased systematic risk accompanying events of consequence. Turnbull [1977] argues that systematic risk may increase when growth in earnings per share tapers off. The results obtained in the multinomial logit analysis provided evidence of much slower growth in earnings per share in the currently interlisting phase when compared to the pre-interlisting stage. Thus the increased systematic risk evidenced in the intervention analysis results is probably not completely attributable to an attenuation of the thin trading bias. Unlike previous studies conducted by Reints and Vandenberg [1975], Ying, Lewellen, Schlarbaum, and Lease [1977], and McConnell and Sanger [1984], which found no evidence of a change in risk when the firm moved from an over the counter market to an organized exchange; this dissertation provides strong evidence supporting the hypothesis of heightened systematic risk following interlisting. Moreover, once such increases in risk as well as the removal of possible autocorrelation is accounted for, excess returns are in general not significantly different from zero. In the cases where significant excess returns were detected, moreover, high critical t values were not used.

Was the market efficient with respect to the interlisting event? Prima facie, the absence of abnormal returns is usually considered to support the hypothesis of market efficiency. However,

given the robust performance of firms during the currently interlisting stage of their evolution, persistence of risk adjusted abnormal returns would also have been consistent with market efficiency. In this study it appears that the heightened risk during the interlisting phase balanced the impact of the more robust performance of firms in the currently interlisting phase of their development.

The results obtained using switching regressions serve to buttress those of the intervention analysis and, furthermore, are congruent with the evidence provided by the multinomial logit analysis. Following international interlisting, a switch in the regression relationship between the realized return of the firm, and the realized return to the value weighted TSE index occurred. From this analysis, it seems apparent that the impact of international interlisting is not fully felt until considerable time following interlisting. In fact, these results fit very well with the interlisting life cycle framework. Within that context, the firm is moving on an upswing trend during the first two stages. When the mature interlisted phase is attained, however, it was seen that the economic performance of the firm was distinctly different in nature when compared to the two previous stages. Hence, the switching regressions may in large part be reflecting the progression of the firm from its currently interlisting stage to the mature interlisted stage. It is also possible that once the firm has become entrenched on the foreign exchanges, its share prices are determined internationally rather than nationally. This argument was favored by Booth and Johnston [1984] in their study of dividend policy as it relates to the interlisted firm.

In conclusion, this dissertation has directly addressed many of the issues surrounding the phenomenon of cross-border listings of securities. The methodological approach employed is useful not only in analyzing the problem at hand, but also is appropriate for a variety of other problems, particularly those focusing upon stock market anomalies. Examination of the underlying economic performance of the firm may serve to clarify many heretofore anomalous results.

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APPENDIX I
ACCOUNTING STANDARDS

This information is taken directly from Robert Bloom's "The Impact of Cultural Differences Between Canada and the United States on Canadian Accounting." Paper presented to the European Institute for Advanced Studies in Management, Amsterdam, June 1985.

KEY DIFFERENCES BETWEEN CANADIAN AND AMERICAN STANDARD SETTING

NATURE OF THE STANDARD SETTING BODY

CANADIAN: AcSC

An arm of CICA; 22 part-time, unpaid volunteers, who serve 3-year terms; has a $450,000 (U.S.) annual budget.

Nothing comparable to SEC. The Canada Business Corporations Act (1975) asserts that financial reports of companies incorporated under this Act must be prepared in accordance with the CICA Handbook, thus making the AcSC the standard setting body. Additionally, various provincial securities commissions require companies that trade their securities in those provinces to adhere to CICA recommendations.

AMERICAN: FASB

Seven full-time, independent, well-paid members, who serve 5 year terms (with one possible renewal); has a $10,000,000 (U.S.) annual budget.

SEC oversees FASB's work.

PROCESS OF STANDARD SETTING

CANADIAN

Uses external task forces to a limited extent.
Emphasizes secrecy: No meetings of AcSC are open to the public.
Relies essentially on research of other standard setting bodies.
Does not use a conceptual framework.
Circulates only exposure drafts to the public.
Holds no public hearings.
Two-thirds vote of AcSC members to pass a standard (recommendation).
Letters of comment only on exposure drafts available for public inspection after the standard (recommendation) has been adopted.

AMERICAN

Uses an external task force for each project.
Emphasizes openness and due process: All meetings of FASB are open to public.

Conducts or funds research to a significant extent (e.g., the economic
consequences of standards).
Uses a conceptual framework for guidance.
Circulates discussion memorandums and exposure drafts to the public.
Holds public hearings on discussion memorandums.

APPENDIX II
QUESTIONNAIRE

1. The idea to interlist on AMEX or the NYSE came from:
   (a) The firm
   (b) The Marketing Department of the Stock Exchange
   (c) Both

2. About how long did it take from your initial application to list on the NYSE (AMEX) until the actual listing took place?

3. When the firm made the decision to interlist, it was hoped that:
   (a) The price of common stock would rise
   (b) The liquidity of the stock would rise
   (c) The firm would be able to tap new equity resources
   (d) The firm would be able to tap new debt resources
   (e) The firm's product sales would benefit in Canada
   (f) The firm's product sales would benefit in the U.S.
   (g) The firm intended to invest in new plant in the U.S.
   (h) Other (please specify)

   Which of the above was (were) considered as overriding factors, if any?

4. As a result of interlisting, foreign sales of the firm's products increased by _____ percent one year after interlisting? Two years? _____? Three years _____?

5. Were U.S. S.E.C. registration requirements viewed as an encumbrance to interlisting?

6. At the time of interlisting on NYSE or AMEX what were the approximate legal and accounting fees incurred in order to satisfy U.S. listing and disclosure requirements?

7. What were the legal and accounting costs to maintaining a NYSE or AMEX listing this year (over and above the NYSE or AMEX listing fees)?

8. From the point of view of the Firm, listing on NYSE or AMEX:
   (a) Accomplished the Firm's objectives
   (b) Was detrimental to the Firm
   (c) Had no effect

9. What made you choose the NYSE (AMEX) as opposed to AMEX (NYSE)?

APPENDIX III
TSE BASED FIRMS INTERLISTED IN THE U.S.

Company Name	Interlisting Date	Exchange
Alcan Aluminium	05/31/1950	NYSE
Inco	12/20/1928	NYSE
Seagram	12/02/1935	NYSE
McIntyre Mines	01/09/1922	NYSE
Campbell Red Lake Mines	04/11/1955	NYSE
Dome Mines	06/16/1915	NYSE
Canadian Pacific Ltd.	01/24/1883	NYSE
Brascan	04/17/1925	AMEX
Imperial Oil	06/27/1921	AMEX
Asamera	01/18/1952	AMEX
Canadian Occidental	02/05/1962	AMEX
Dome Petroleum	09/22/1952	AMEX
Husky Oil	06/14/1960	AMEX
North Canadian Oils	03/13/1922	AMEX
Prairie Oil Royalties	05/29/1956	AMEX
Scurry-Rainbow Oil	02/17/1959	AMEX
Cominco	10/16/1925	AMEX
Lake Shore Mines	06/27/1921	AMEX
Wright Hargreaves Mines	06/06/1927	AMEX
Canadian Marconi	12/20/1925	AMEX
Domtar	10/16/1930	AMEX
Ford Canada	04/30/1929	AMEX
Redlaw	09/20/1946	AMEX
Rio Algom	07/01/1960	AMEX
Gulf Canada	06/27/1921	AMEX
Giant Yellowknife	07/11/1960	AMEX
Westcoast Transmission	08/15/1964	NYSE
Massey Ferguson	03/07/1966	NYSE
Bow Valley Ind.	06/21/1968	AMEX
Placer Development	03/19/1969	AMEX
Genstar	08/25/1969	NYSE
Banister Continental	04/02/1970	AMEX
Total Petroleum	01/06/1970	AMEX
Northgate Exploration	02/03/1970	NYSE
Numac Oil & Gas	01/06/1972	AMEX
Quebecor	01/19/1973	AMEX
Chieftain Development	04/14/1975	AMEX
Northern Telecom	11/10/1975	NYSE
Bell Canada	08/18/1976	NYSE
Inter-City Gas	08/30/1978	AMEX
Westburne International	05/10/1978	AMEX
Page Petroleum	10/26/1979	AMEX
MacMillan Bloedel	12/21/1979	NYSE
Texaco Canada	08/01/1980	AMEX
Moore Corp.	13/11/1980	NYSE

APPENDIX III CONTINUED

Company Name	Interlisting Date	Exchange
Walker Resources*	04/10/1980	NYSE
CP Enterprises	07/20/1980	NYSE
Mitel	05/18/1981	NYSE
Echo Bay Mines	10/11/1983	AMEX
MSR Exploration	09/13/1983	AMEX
Campbell Resources	06/13/1983	NYSE
Ranger Oil**	01/28/1983	NYSE
Malartic Hygrade	07/06/1984	AMEX
Sceptre Resources	10/17/1984	AMEX

*Date of listing following merger. Original firm had been listed since 1945.

**Date of switch from AMEX to NYSE. Firm interlisted in 1971.

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APPENDIX IV
VARIABLES USED IN MULTINOMIAL LOGIT ANALYSIS

Variable definitions are adapted from Compustat User's Manual [1984].

Total Assets:
The sum of current assets plus net plant plus other non-current assets. Non-current assets are defined to include intangible assets, deferred items and investment advances.

Long-term Debt:
Debt obligations due more than one year from the company's balance sheet date.

Net Sales:
Gross sales less cash discounts, trade discounts, returned sales and allowance for which credit is given to customers.

Available for Common:
Income before extraordinary items and discontinued operations less preferred dividend requirements. This variable is adjusted for the additional savings due to common stock equivalents.

Common Dividends:
Total dollar amount of dividends, excluding stock dividends, declared on the common stock of the company during the year.

Common Shares Outstanding:
The net number of all common shares outstanding at year end excluding treasury shares and scrip.

Common Shares Traded:
The number of common shares traded on a calendar year basis for all exchanges.

Capital Expenditure:
The amount spent for the construction and or acquisition of property, plant and or equipment.

Common Equity as Reported:
This variable includes the dollar value of common stock outstanding including Treasury Stock adjustments, capital surplus, and retained earnings.

Operating Income Before Depreciation:
Net sales less cost of goods sold and operating expenses. Operating expenses are exclusive of depreciation, amortization and depletion.

Earnings per Share:
Primary earnings per share excludes extraordinary items and discontinued operations. For Canadian companies the value of earnings per share is based on the class of stock most widely held and traded in Canada.

VARIABLES CALCULATED BASED ON THE PRECEDING DEFINITIONS

RETURN ON INVESTMENT (ROI):
Operating Income Before Depreciation/Total Assets

RISK:
Standard deviation of the ratio:
Operating Income Before Depreciation/Common Equity as Reported

Dividend Payout:
Common Dividends/Earnings Available for Common

Liquidity:
Common Shares Traded/Common Shares Outstanding

Growth in Long-term Debt:
Percentage Change in Long-term debt calculated annually

Growth in Earnings per Share:
Percentage Change in Earnings per Share calculated annually