# VALUE GAIN FROM CORPORATE REORGANIZATION

Collected Papers on Divestitures through Traditional Routes

and

Reorganizations as Income Trusts in Canada

by

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## Abstract

In the absence of taxes and transactions costs, there can be no benefit to corporate reorganization from a financial standpoint, but 'real world' limitations and frictions do provide additional value that is gained through divestitures in terms of focus and financial flexibility. Herein, the corporate divestiture decision is analyzed to determine the motivation for a parent company either to cleave its offspring directly to the external capital market in an equity carve-out or to distribute the shares to the existing shareholders in a tax-free spin-off. Cash flow performance, asymmetric information, relative size of the divestiture, and relatedness of the parent's and subsidiary's operations are all found to contribute significantly to the divestiture decision. In Canada, an alternate form of security, known as the income trust unit, has become popular for corporate reorganizations, either through an initial public offering or as a conversion of shares. The flow-through structure of income trusts currently allows avoidance of corporate taxation to offer higher pre-tax returns to retail investors, in a market setting where yield is increasingly equated with value. To determine placement of these securities in the market, the risk of the income trust organizational form is analyzed and compared to the standard corporate form. Further, a number of publicly known characteristics of the income trusts can predict the relative risk of this type of investment. In recent 'hot markets' for these securities, proof is uncovered that unsuitable firms have been migrating to this sector, but valuation of the investments in this sector has remained fair and full. Although pending legislation will discontinue the tax-exempt status of income trusts in 2011, during their tenure these securities have improved the Canadian market. Based on the data analysis herein, all types of

divestitures studied have been predicted to provide commensurate value with respect to risk depending on the nature of the subsidiary.

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# Chapter 1

## Introduction

Corporate reorganization to change capital structure cannot theoretically affect the value of the firm in the Modigliani-Miller (1958) world without taxes or transaction costs. These frictions do exist, however, and are exacerbated by limitations in monitoring, conflicts through agency concerns, and uncertainty from asymmetric information. In this more complete financial landscape, there are advantages to adapting capital structure and gaining operational focus through divestiture. In this thesis, we examine three types of divestiture, the tax-free corporate spin-off, the equity carve-out, and the income trust reorganization. Each method of subsidiary formation results in a new publicly traded security in the market, but these securities differ in their market timing, tax treatment, valuation, retained ownership, and capital structure. Large conglomerates must choose the best method to divest of a subsidiary to maximize the value of the transaction and may indeed choose different routes for dissimilar divisions.[1]

Chapter two investigates the conventional choice between a tax-free corporate spin-off, where the new shares are distributed evenly to the existing shareholders, and the equity carve-out, where an initial public offering (IPO) is held to sell shares directly into the market. Considering these transactions from the perspective of their option-like characteristics allows prediction of the divestiture decision based on the criteria of cash

[1] For example, ACE Holdings, the parent company of Air Canada, divested of the Aeroplan Rewards division and Jazz regional airline as income trusts and then carved out a medium equity stake in the flagship operation, Air Canada.

constraint, information availability, market reputation, liquidity, and relatedness of operations. A logistic probabilistic response is tested empirically using regression analysis. Results correspond well with the existing literature that demonstrates that cash constraint is a major force promoting divestiture via an equity carve-out, since this method raises cash in the IPO process. The study extends the extant literature by uncovering a significant information effect that motivates divestiture. Where the parent firm is better known to the investment community, an equity carve-out will be undertaken rather than a spin-off. By considering the fractions divested in the equity carve-outs, the model also demonstrates that larger, related subsidiaries are more likely to be split off in a minority stake, with less than twenty percent offered to the public. The logistic model has provided both a method to predict the divestiture type for investors and a recommendation towards best practices for the parent firm's management.

The third and fourth chapters focus on the specific and recently popular organizational form of the income trust, which may be formed either as a conversion of existing shares to trust units, similar to a spin-off, or through an initial public offering of units, similar to an equity carve-out. The benefit of this structured financial form derives from the tax advantage of the 'flow-through' reorganization in which corporate tax is avoided by amassing a large expense commitment to decrease profits near to zero. To meet the regular expense payments, the monthly cash flow should be stable. The trust reorganization is not unlike a management initiated leveraged buy-out, but here the increased risky debt obligation is bundled with the remaining equity stake into the trust

unit and sold to investors. As suggested by Jensen (1989), this corporate form has several positive attributes deriving from elimination of agency costs in the organization and may have the potential to replace most firms in mature industries that carry less financial leverage. In addition to the discipline afforded by the high distribution payments, the trust structure results in increased monitoring by the external market,[2] and provides higher pre-tax payouts to a yield hungry investment community. Due to these advantages, the income trust, which has no restrictions for its operation in the Canadian economy, has become widely popular with investors. Although there is now pending legislation, announced on October 31, 2006, that will interrupt the tax benefit of these organizations by 2011, most remain actively traded.

The rapid rise in the number of trust conversions has also raised controversy concerning their beneficial position with respect to tax avoidance and worries that unsuitable firms might migrate to this sector for tax reasons alone. The presumed risk of income trusts was widely reported by investment advisors and the security rating agencies. The specific type of firm that benefits from the trust structure should exhibit less risk, however, and demonstrate relatively stable cash flow. These characteristics are often associated with mature firms in established industries. These two chapters aim to present a balanced description of income trusts based on their risk and expected returns, during their period of IPO dominance in the investment landscape.

[2] This benefit is described by Easterbrook (1984) and Rozeff (1982).

In chapter three, the historical volatility estimates of the income trusts currently trading in Canada are compared to the volatility estimates of a matched set of firms of similar size in similar businesses. The trusts are found to be more stable in terms of empirical return volatility. The return versus risk is evaluated using three accepted performance ratios, and here the income trusts are found to be comparable to the matched firms, as expected in an efficient capital market. That is, for the decreased level of risk in the sector, a decreased return is also expected, which implies that their relative valuation may be considered appropriate. Income trusts may be broadly characterized into four industry classifications: real estate investment trusts (REIT's), oil and gas production (energy) trusts, utility trusts, and business trusts. The tests separating these classes do indicate that risk is reduced by focus on the more stable industry sectors. Of the two basic income trust structures, the royalty structure, in which distributions are paid as a royalty payment, results in lower volatility estimates than the investment structure, in which distributions are paid as a combination of subordinated interest, dividends, and return of capital. Finally, the industry and structure dimensions are tested using a mean-variance spanning analysis that finds weak evidence of an enhancement to the efficient frontier for portfolio selection. Similar to the performance ratio results on the collected sample of income trusts, the equally-weighted indexes of trusts are found to improve the capital market but they do not complete the market of investments in Canada.

In chapter four, publicly available information is analyzed for the sample of income trusts to determine which firm characteristics contribute to the historical return

volatility of income trusts. The motivation in this section is first to identify factors that might increase risk in this sector, second to relate these results to findings from the normal corporate form, and third to test whether younger income trusts are more risky than established players in this sector. The regression analysis provides an explanation for approximately one third of the variation in the volatility results and thus provides some promise for investor selection of lower risk income trusts using the model. Income trusts in more focused operations are less volatile, but otherwise the results for income trusts are found to be similar to effects reported in the corporate finance literature. Newer entries to the sector do demonstrate higher risk when introduced into 'hot' markets, but our chosen indicators of instability do not suggest that income trusts are poorly conceived or operated. Due to the non-normal distribution of errors in our sample, significance testing in this study is accomplished by robust estimation of confidence intervals using the bootstrap technique described by Efron and Tibshirani (1993). Volatility as a proxy measure for risk in the trust sector has been thoroughly characterized in the latter two studies to allow further comparisons with the more general divestiture methods of spin-offs and carve-outs in future studies.

# Chapter 2

## All Carve-outs are Not Equal: An Analysis of Divestitures comparing Spin-offs and Carve-outs


### 2.0 Abstract

By comparing a sample of spin-offs to a sample of carve-outs in the period from 1980 to 2003, this empirical study relates the choice between these divestiture methods to measurable aspects of the parent firm. In agreement with the existing literature, the primary motivation to divest through a carve-out is the cash constraint, captured by the proxy of cash flow performance in the year prior to divestiture. Additionally, we find a measurable information effect. When asymmetric information is likely, the spin-off shareholders gain value by waiting for the subsidiary value to appreciate. If the parent firm is better known to investors, then an equity carve-out is more likely. Carve-outs are then divided into three logical groups, based on the percentage of the subsidiary offered in the initial public offering (IPO), to provide a clearer description of the divestiture decision. Change in cash flow, available information regarding the parent, debt ratio, relatedness and relative subsidiary size all influence the multilateral decision towards the fractional equity carve-outs. When a relatively large subsidiary is in a related business to that of the parent, a spin-off is unlikely and a minority carve-out can be expected. As cash constraint increases, a majority carve-out relinquishing control is more likely.

## 2.1 Introduction

When a division of a corporation becomes too large, provides a poor fit with the remainder of a firm's predominant business, or adversely influences the financial structure, the division may need to be weaned from the internal capital market. Such a divestiture can take place via several paths, including a direct private sell-off, a subordinate spin-off, or an equity carve-out. In the latter two cases, a separate publicly traded subsidiary is formed.

In this chapter, we use an empirical approach to study the motivation for the parent firm to divest by either an equity carve-out or a spin-off. The choice between these two strategies is modeled with respect to various characteristics of the parent to determine which effects might allow ex-ante prediction of the divestiture method. This is not the first paper to investigate the divestiture decision, but it does contribute to the existing literature by providing a comprehensive study that includes most of the corporate divestitures in North America that can be reasonably traced from 1980 to 2003. Prediction is improved by including an information effect due to financial analyst following, by considering the relative size of the subsidiary, and by extending the analysis to use three categories of fractional carve-outs to provide a multivariate response. The significant results of this study provide an increased dimension to this divestiture decision beyond the established result that the need for cash leads to an equity carve-out (Anderson (2002)).

The correct model of divestiture choice will serve the investment community and may establish best practices in subsidiary formation. Since our model uses known characteristics of the parent to predict which firms divest by either a spin-off or a carve-out, investors may be able to anticipate a spin-off decision. Purchasing shares of the parent firm allows investors to be included in the pro-rata distribution of shares of the subsidiary and it is well established that owners receive a benefit from the expected abnormal returns associated with these divestitures. (Hite and Owers (1983), Miles and Rosenfeld (1983), Schipper and Smith (1983), and Cusatis, Miles, and Woolridge (1993,1994)). Further, Allen (2001) posits that asymmetric information may account for additional value received from trading shares of the spin-off following divestiture, based on the behavior of insiders. Thus, this study is partially motivated by the fact that correct prediction of the spin-off divestiture may provide a financial reward for investors.

From an investigative standpoint, the development of an appropriate model will establish the pattern of corporate actions of the last two decades and may provide a description of best practices in the choice between methods of divestiture. Where management acts in accordance with such practices, the firm will signal its value. The action translates directly to a market reaction since the expectations of the investment community and security offering prices are set based on the principle of supply and demand. Where a fractional carve-out is being considered, the amount available for purchase will determine the response to the initial public offering (IPO). Allowing too great a fraction to be sold could lead to over supply of the security and subsequent

under-pricing in the market. By assigning the fraction offered as a response variable, we can predict a result that would not generally be known prior to divestiture.

This research is closely related to the studies of Michaely and Shaw (1995), who restrict their attention to Master Limited Partnerships and Frank and Harden (2001), who work within a reduced time period. This work extends both efforts by providing a much larger, more general sample that spans two full economic cycles of activity in divestiture covering the 1980's and 1990's.[3] Similar to the unpublished work of Reeves (1999), we do not limit the investigation to minority carve-outs; instead, carve-outs are arranged into three categories, based on the percentage retained by the parent firm, which may be related to tax or control considerations. The similarly sized sub-samples allow modeling of the importance of several publicly available firm characteristics against a multilateral divestiture decision.

The choice of divestiture method is presented in the remainder of the chapter as follows. In Section 2.2, the divestiture methods are compared and the literature is reviewed. An option theoretic explanation supports the formation of the testable hypotheses set out in Section 2.3, while Section 2.4 outlines the sample selection and analytical approach. The results are discussed in Section 2.5 and the conclusion is advanced in Section 2.6.

[3] Mitchell and Mulherin (1996) and Mulherin and Boone (2000) study industry shocks through the two decades and the latter authors find similar patterns in the second half, 1990-1999, as the first.

## 2.2 Description of the Decision in Extant Literature

A firm considering a subsidiary divestiture has generally supported a division through the period where shielding from information is required and incentives are a problem (Alchian (1969)). The company has provided sufficient seed capital to the division, usually via the internal capital market, to ensure its short-term survival. When the division has progressed to the stage where additional investment or restructuring is required, either funds may not be internally available or investment may not be justified under the current mandate of the parent firm. Both carve-outs and spin-offs offer the flexibility to separate the financial dealings of the newly formed subsidiary from the internal capital market of the parent corporation.

An equity carve-out creates a firm when a parent company sells a portion of the subsidiary or division to external investors through a public offering. In contrast, a tax-free spin-off splits a firm into two separately traded entities by allocating the ownership of the division in a pro-rata distribution to the existing shareholders of the parent firm, generally with respect to common shares held. Thus the two transactions differ in the following ways:

1) Spin-offs are non-cash distributions, while the carve-out generates cash in an IPO.
2) Because the public offering is avoided, spin-offs are generally cheaper with less disclosure required.
3) Spin-offs provide a continuity of ownership, while carve-outs introduce new shareholders.

4) The carve-out IPO provides direct access to, and valuation by, the external capital market, whereas for the spin-off, the effect may be delayed.
5) When a minority stake is carved out, the parent may retain management control of the subsidiary, while a spin-off results in a new slate of managers.

The equity carve-out raises funds from external investors in the IPO but the process is not costless. From 7% to 18% of the IPO value is often "left on the table" based on first day returns reported by Ritter and Welch (2002). While direct transaction costs of registration, underwriting, investment banking and selling fees all contribute to expenses[4], a larger indirect cost of preparation for a public offering results from provision of sufficient disclosure to ensure a fair valuation in the market. By contrast, the spin-off controls the distribution of shares within the organization, so that existing shareholders lose very little value and transaction costs are reduced. Michaely and Shaw (1995) find costs associated with equity carve-outs to be three times as large as those associated with spin-offs. From a financing perspective, the divestiture choice must balance the expected cash inflow from the IPO against the relatively higher cost associated with the equity carve-out transaction.

Fair valuation relates directly to the availability of information. If all agents in the external market have the same information, then the appropriate level of capital may be raised at the right price through either a seasoned equity offering or a carve-out IPO. Nanda and Narayanan (1999) develop an economic argument suggesting that

[4] To some extent these costs also relate to information gathering.

information asymmetry between insiders and the market is sufficient to justify the higher costs of divestiture, when considering asset sales, equity carve-outs, and privatizations. To include spin-offs in their model, the need for future external financing has to be introduced. In a study devoted to spin-offs, Krishnaswami and Subramaniam (1999) find that asymmetric information, as measured by several accepted proxies, is higher in a sample of firms that undertook spin-off divestitures when compared to a control sample that do not divest. Their research is extended in accordance with the Nanda and Narayanan (1999) prediction, to demonstrate that more capital is raised by the spin-off following divestiture, after the information asymmetry is reduced. This is not the only reported effect of information asymmetry, however, where a spin-off is concerned.

Where additional value in the subsidiary cannot be easily known by the market, the argument for spinning-off the division becomes stronger. Allen (2001) tracks share ownership related to insider behaviour and finds that managers do have better information than the market in most cases. Insiders buy offerings from institutional investors that subsequently yield positive returns. Whether attributed to signaling or true value, the insiders believe the market price is low and then benefit from buying the spin-off before the market can adjust. Similarly, insiders sell shares into the market prior to future negative returns. Shares are traded without the information gathering and valuation procedure that generally accompanies an IPO, and in either case, the advantage of the spin-off benefits the well-informed, existing shareholders, who maintain ownership in the spin-off transaction.

Motivation for an equity carve-out is raised by Nanda (1991), through an equilibrium modeling argument based on an extended Myers and Majluf (1984) framework. In accordance with the empirical evidence, he proves equity carve-outs are generally received positively in the market, when compared to seasoned equity offered by the parent firm. By indicating that its shares are not currently over-priced, the parent signals its own value in offering the carve-out. Under these circumstances, the market value of the parent firm is not a critical factor in the choice of divestiture. However, the cost of the carve-out IPO will be reduced if information is less costly for the parent firm. Following Banz' (1981) report of market anomalies associated with firm size, the market value of the firm has been linked with superior, less costly information, whether this is due to cheaper production and dissemination costs or greater market interest. Zeghal (1984) finds larger firms to be so well known that their financial statements only report information that has already been anticipated by investors. In studies specific to divestitures, Anderson (2002) finds the existence of a positive relationship between carve-outs and firm size and Michaely and Shaw (1995) report similar results for a sample of Master Limited Partnerships. Larger, prominent firms seem to incur less expense in a public offering and thus prefer to divest via an equity carve-out.

Cash availability is considered a key factor in the decision to undertake a public offering such as an equity carve-out. If the parent is unable to provide the required funding to a division, there may be no choice on the preferred method of disposal. Zingales (1995) and Allen and McConnell (1998) assert that control considerations are

balanced against cash constraint in situations where equity carve-outs are undertaken. Without an acceptable private offer, the need to raise capital dictates the need to divest by a carve-out. Anderson (2002) tests a concurrent decision-making framework and finds that the likelihood of raising capital drives the likelihood of restructuring and not the opposite. Her method concentrates on the availability of cash within the company by comparing cash generated in a previous year to the capital expenditures in the year of divesture. The requirement for sufficient cash flow is found to have an important effect.

Pagano, Panzetta, and Zingales (1998) study a group of private companies in Italy that choose to go public and, from increased reporting requirements in that jurisdiction, the authors are able to gain insight on the decision to raise external capital. Firms are found to operate until the time of the public offering using debt financing, but the investments made prior to the offering raise leverage beyond the optimal level for the firm. The need to repay that debt imbalance is reported as central to the decision to go public. Results of Allen and McConnell (1998) also support this position, finding poor operating performance and cash constraint evidenced by high leverage in firms that subsequently participate in equity carve-outs. In a subsidiary divestiture via an equity carve-out, the authors find higher returns result when the proceeds of the IPO are used to pay down debt, to revert back to a preferred capital structure.

When the divestiture is not forced by financial constraint, the restructuring may result in benefits due to increased focus. In a diversified firm, unrelated products or services

have been found to offer few synergies to the combined interest and may contribute to a diversification discount (Berger and Ofek (1995,1999), Comment and Jarrell (1995)). Separation of unrelated interests should provide an increased valuation of either the parent or the subsidiary in a more focused line of business. More recently, Graham, Lemmon, and Wolf (2002) suggest that the diversification discount is not evident in the data when accounting inconsistencies are resolved and that lower returns often result from acquisition of a poorly performing firm. In this case, the performance of the poorly performing subsidiary contributes to asymmetry and undervaluation as described by Nanda and Narayanan (1999), and divestiture by either carve-out or spin-off should be satisfactory to increase value. Kaplan and Weisbach (1992) provide evidence that such poor acquisitions are more likely to result in a subsequent divestiture when the subsidiary is in an unrelated business. The increased focus hypothesis predicts an increase in value from restructuring independent of the method in which the subsidiary is formed.

Value gain in divestiture may also be found in operating efficiency. Gertner, Powers, and Scharfstein (2001) find that diversified firms are not optimal in their investment strategies, resulting in poor growth prospects. The authors attribute value creation to better alignment with the associated 'pure-play' competitors in the industry, indicated by improvements in Tobin's Q and appropriate investment levels after divestiture. Using an agency-theoretic approach, John (1993) proves that positively correlated cash flows provide a sufficient condition for a spin-off to provide value when leverage benefits are considered. Rebalancing the capital structure via the spin-off transaction

creates value without an immediate infusion of additional capital. Leland (2007) develops a theoretical model that includes a limited liability argument to demonstrate that purely financial synergies, absent of operational synergies and agency costs, may have a measurable effect on the results of corporate mergers. The author finds negative synergies are sufficient to motivate separation of assets when cash flows are correlated but the risks of the separate entities must be dissimilar. Risk is considered to arise from both cash flow volatility and bankruptcy concerns. Recently, Chemmanur and Nandy (2006) find that efficiency gains from tax-free spin-offs result primarily from cost savings in operations overseen by the parent firm. From a unique longitudinal database, the authors are able to track the performance of the division within the diversified parent prior to the split and note how the operations change with the divestiture. In their sample, the underperforming subsidiary does not improve; rather, full firm performance becomes more efficient by cost reduction after splitting the operations. This work nicely combines the cost saving effect reported by Barber and Lyon (1996) with improvement in the parents' efficiencies documented by Daley, Mehrotra, and Sivakumar (1997). In any of these situations, the cash flow available from the equity carve-out is not required to create value and the spin-off provides a lower cost alternative for divesting.

All carve-outs are not equal, however, and the final difference between the equity carve-out and the spin-off lies in the extent of the divestiture. While the tax-free spin-off must distribute a minimum of eighty percent of the equity in the subsidiary to the shareholders, the equity carve-out can be set at any fractional amount and management

of the parent can be retained to a significant extent. In fact, Reeves (1999) finds a fairly even weighting across retained ownership levels in the categories of less than fifty percent, from fifty to eighty percent, and greater than eighty percent. If the subsidiary is unrelated to the parent, the highest returns result from divestitures above fifty percent. Returns to parents are also high when the subsidiary is related and control is either relinquished in a divestiture greater than fifty percent or retained in a carve-out of a minority stake, less than twenty percent. From an efficiency perspective, Schoar (2002) finds that diversified firms in related businesses demonstrate improved productivity when compared to their industry peers. When the parent has a definite advantage in a certain industrial sector, synergies transfer easily to a related subsidiary. In this case, inside management are best able to exploit the advantages by continuing the operations post divestiture, through a minority carve-out. Further, competition is prevented from learning the technology if the subsidiary remains under the parent's wing.

In a minority carve-out, the parent continues to hold the option to spin-off the remainder of the subsidiary at a later date in a two stage combination carve-out spin-off, a more complicated transaction that is becoming increasingly popular (Thompson and Apilado (2006)). Recent work by Vijh (1999) indicates less under-pricing in these carve-outs associated with subsequent spin-offs when compared with other IPO's. Returns to the parents are 2% higher when compared to carve-outs without subsequent spin-offs. Value is attributed to the continued monitoring by the parent and the economic consideration of restricted supply in the IPO. This effect is more important

as the size of the subsidiary increases relative to the size of the parent. As suggested by Shleifer and Vishny (1992), liquidity may be inversely affected by size since the pricing in the public offering depends on the market's willingness to absorb the divestiture. Schlingemann, Stulz, and Walking (2002) have introduced a liquidity index, which captures the intensity of capital transactions in SIC industry classifications. Related to this measure, they find significant effects on a firm's success in divesting via a carve-out and on the choice of the division that is split from the firm. Thus the flexibility of the carve-out strategy to respond to varying levels of market demand may sway the divestiture decision towards the best option. Although the consideration of combination 'carve-out spin-offs' is beyond the scope of this study, the compiled findings on liquidity effects remain applicable to the decision to undertake a minority equity carve-out, where less than twenty percent of the subsidiary is sold.

As noted above, this paper is closely related to the studies of Michaely and Shaw (1996) and Frank and Harden (2001). In each of these works, the decision towards divestiture method is investigated, while most other studies have focused on findings associated with spin-offs or carve-outs separately. In their approach, Michaely and Shaw (1996) choose a sample of Master Limited Partnerships (MLP's) to avoid taxation and control issues. This simplifying measure restricts the size of their dataset greatly and leads to the study of a unique group of companies, who have self-selected the MLP structure. These firms are not unlike the firms that have become income trusts in Canada in recent years: they are larger than comparable firms involved in IPO's and spin-off conversions are concentrated in a single industry (oil and gas). With this

sample, the authors find that riskier, higher leveraged, and less profitable firms pursue spin-offs but also conclude that cash constraint is not a significant motive in divestiture choice, an opposite result to Anderson (2002). Also, the performance of the divested entities is found to be poor afterward, which is not consistent with the findings of Cusatis et al (1993). Frank and Harden (2001) restrict their sample in the period of study from 1991 to 1997 and the authors extend our understanding of the problem by incorporating Graham's (1996) marginal tax rates. These authors highlight the differences between master limited partnerships and more ordinary corporate divestitures by reestablishing the cash motive put forward by Allen and McConnell (1998) and by introducing the importance of asset quality affecting market demand. In their work, Graham's (1996) marginal tax rates have a significant effect on the divestiture decision. These papers set the foundation for the current study.

### 2.3 Interpretation of Decision and Hypothesis Formulation

To compare the two types of divestiture from a financial standpoint, we posit an options-based framework. From an algebraic rearrangement of the put-call parity relationship, any stock can be valued as a combination of a long call, a short put, and the present value of the exercise price. Shares of the spin-off can be considered as such a package of options, which has been split from the stock performance of the parent firm. The subsidiary is a combination of a long call, a short put, and the exercise price is equal to the cash likely to be raised in the IPO process at the time of divestiture. From this standpoint, a carve-out would be valued solely as the cash raised in the public offering after the information gathering expenses are subtracted. The choice of

divestiture relies on the value of the option package, which increases with higher costs of IPO preparation that effectively drive down the exercise price. In the best case for the holder of the spin-off, the stock price of the subsidiary rises, the call option gains value and the put falls out of the money. The spin-off is desired whenever the future expected value of the subsidiary, discounted back at an appropriate rate, is considered to be above the current value that might be raised in an IPO.

When the parent corporation considers its combined operations to be under-valued, it would benefit from choosing a spin-off as the divestiture choice. While both the call and the put options gain value as volatility rises, the upside potential should increase as growth opportunities are given time to mature. This is the value of delayed access to the financial market inherent in the spin-off method. Additionally, the structure of the subsidiary can be altered to increase leverage during the restructuring. A lower proportion of the equity stake will provide an increased return if the subsidiary's operation were to be successful and an increased price were to be realized. Thus a riskier, growth-oriented subsidiary benefits from the spin-off strategy, consistent with the findings of Michaely and Shaw (1995).

If relevant information about the growth prospects of the subsidiary is not known or cannot be known by the market at the time of divestiture, then under-valuation is more likely and the under-pricing of an IPO might be anticipated. As size has been shown to be correlated with increased information, we should expect that smaller, less well known companies would also divest via a spin-off. In the option framework, a situation

where the parent and subsidiary are currently over-valued can also be considered. When the expected value of the short put is more accurately known by the existing shareholders, they would prefer to quietly unload the shares of the subsidiary into an unsuspecting market rather than confront the disclosure associated with the IPO process. The tactics associated with both under-valuation and over-valuation are documented by Allen (2001).

From the advantages of reduced costs and asymmetric information deriving from internal distribution to shareholders, we derive our **Hypothesis I**. Ceteris paribus, we expect a firm that has the choice to divest via spin-off or equity carve-out to preferentially choose to spin-off a subsidiary.

The carve-out results in the loss of a fraction of proceeds from the subsidiary's future operations for an agreed amount of cash. If the subsidiary is not well known to investors, there will be greater uncertainty in the amount of cash likely to be raised. First, the value of the offering may suffer from some under-pricing (Ritter and Welch (2002)). This establishes a lower strike price for the corresponding spin-off long call option and short put option and that combination becomes more valuable as under-pricing increases. To reduce this cost, information must be available to the market. A subsidiary's value may be more easily determined if the parent's operation is well known and its market price is a fair representation of firm value. Otherwise, information on the firm must be made less costly to the investing public. In either case, the subsidiary price should be more easily estimated in the IPO book-building process.

We expect that firms settling on equity carve-outs have come to their financial limit in supporting the division, while still maintaining a strong market reputation. Nanda's (1991) equilibrium argument proves that equity carve-outs are generally received positively in the market, when compared to seasoned equity offered by the parent firm. The parent signals its own value by choosing to offer the carve-out. Under these circumstances, the market value of the parent firm is a less critical factor in the choice of divestiture. This study aims to clarify the effect of reputation by introducing suitable proxies. Older firms, larger firms, and firms with higher bond ratings are generally more stable with respect to default risk, and these variables may relate well to market reputation.

The IPO process does raise external capital for the parent and associated costs are due to information gathering. A firm that is truly cash-strapped but has sufficient liquidity in the external market may be able to raise money efficiently. To support the equity carve-out decision, the parent's shares should not be greatly under-priced[5]. To this end, reliable information on the firm and associated subsidiary must not be costly, lessening the probability of information asymmetry. A relatively large following of financial analysts, or greater size, would make a firm better known to the investment community. In each of these cases, the company would be expected to receive a fair valuation in the public offering of the carve-out.

[5] Schlingemann, Stulz, and Walking (2002) consider a similar idea from an alternative viewpoint by introducing a liquidity index that indicates whether the market for trading in a given industry is active.

Our second set of complementary hypotheses asserts that firms, which can afford to arrange an IPO, will carve-out the subsidiary. By **Hypothesis IIA**, a firm that has a good financial reputation will be more likely to divest using an equity carve-out. Similarly, where information on the firm is available or less costly to produce, a carve-out would be preferred, according to **Hypothesis IIB**.

Cash constraint is an established motivation for splitting a company via an equity carve-out. The need for funding can be directly evidenced in the cash flow performance of the parent company relative to its investment opportunities. If the firm has previously foregone positive net present value (NPV) projects, the accounting data for the parent would report lower cash flows relative to capital expenditures, similar to the findings of Anderson (2002). A trend is directly indicated as unsustainable if cash flow is dropping, capital expenditures are rising, or capital expenditures are out-pacing available cash flows.

Alternatively, if the situation is closer to that described by Pagano, Panzetta, & Zingales (1998) where an investment has already been made, then the use of capital is intended for debt repayment. The financial leverage of the parent will tend towards a higher debt obligation and the capital structure should be skewed from its normal ratio. The increase in leverage should predict a carve-out.

Thirdly, Tobin's Q can provide an indicator of growth prospects against which investments can be measured. Gertner et al (2001) indicate that spin-offs increase their

investments to become more similar to pure-play competitors with respect to industry median growth opportunities. A difference prior to divestiture may result from financial constraint, with investment restricted somewhere below the optimal industry investment level. Lower Tobin's Q values will reflect this concern, further suggesting an equity carve-out.

The third hypothesis aligns with previous work predicting that cash constraint will lead to an equity carve-out. The measures of cash constraint derived from the theoretical arguments above are reduced cash flow, increased financial leverage, and restricted investment. In **Hypothesis III**, we suggest that a cash-constrained firm will be more likely to divest through carve-out.

Increase in the package of options that constitutes a spin-off is not related to a cash inflow that provides financial flexibility. Increased valuation relies on the efficiency and focus arguments that largely depend on the relatedness of the subsidiary's operations with the business of the parent firm. Although this characteristic has proven important in previous studies of mergers, acquisitions, and internal capital markets, results of the relatedness effect with respect to divestitures are mixed.

From an efficiency standpoint, Schoar (2002) finds that diversified firms in related businesses demonstrate improved productivity when compared to their industry peers. Therefore little incentive exists for the complete separation of a related subsidiary from the parent, as required by a tax-free spin-off. Compared to spin-offs, any carve-out at

less than eighty percent of subsidiary value would retain increased control and also result in greater cash availability due to IPO proceeds. Relatively less information would be required in the disclosure process if the subsidiary was easily associated with the parent's core activity and continued monitoring might be expected to eliminate agency concerns. Consistent with Zingales (1995), for related subsidiaries and parents, the equity carve-out should be preferred.

Alternatively, John (1993) proves that positively correlated cash flows provide a sufficient condition for a spin-off to provide value when the benefits from flexible financial leverage are considered. As industries in similar businesses might be expected to have correlated cash flows and since the spin-off is less costly, firms looking to capture these benefits may divest related subsidiaries efficiently through spin-offs. More recently, Leland (2007) develops a strictly financial analysis of synergies that also predicts benefits to divestiture when correlation of cash flows is high. With significant differences in volatilities and default risks, the separation of assets is justified. Thus correlated cash flows are important to the decision but dissimilar risk profiles may be more likely in less related industrial sectors. From these results, no direct relationship can be posed, but the separation of interests may still be accomplished most economically through the spin-off transaction for those parents whose subsidiaries are in a related but more speculative business.

It has been widely held that diversified firms in unrelated industries suffer from diversification discounts (Berger & Ofek (1995), Comment & Jarrell (1995)).

However, Graham, Lemmon, and Wolf (2002) suggest that the diversification discount may result largely from a previous poor acquisition and Nanda and Narayanan (1998) provide a suitable model to establish undervaluation in the case of an unrelated underperforming subsidiary. An under-valued or discounted firm would prefer to hold the call option associated with a spin-off rather than settle for a reduced cash amount. In this case, an unrelated subsidiary would be predicted to be split via a spin-off.

Therefore, it is uncertain whether divisions in related industries are more likely to be spun-off or carved-out as a minority stake, based on considerations of competition, productivity, and correlated cash flows. This leads to our final pair of competing hypotheses. In **Hypothesis IVA**, divisions in related industries are more likely to be divested through a spin-off, if correlated cash flows and retention of private information are most important. By the alternative **Hypothesis IVB**, divisions in related industries are more likely to be divested through a minority carve-out, in which control is maintained.

To extend the analysis to cover the complete dimension of the carve-out decision, we consider the amount of the subsidiary divested. In the case of a minority carve-out where less than twenty percent of the subsidiary is offered, two benefits to the parent are noteworthy. The option to complete a tax-free spin-off at a later date still remains[6,7] and the subsidiary may continue to operate within the parent's influence. Recent work

[6] Although consideration of these two stage combination carve-out spin-offs is beyond the scope of this study, this choice of divestiture is becoming increasingly common. See Thompson and Apilado (2005)
[7] All efforts have been made to remove such transactions from this study, but the parent firm does retain the option of a later tax-free spin-off when a minority stake is initially offered.

by Vijh (1999) has indicated less under-pricing in carve-outs associated with subsequent spin-offs when compared with other IPO's and returns to the parents were 2% higher when compared to carve-outs without subsequent spin-offs. Up to the twenty percent level of divesting, no change in reporting is required for income tax purposes and profit from the subsidiary could potentially service interest payments for the parent's debt tax shields. Parent firms in serious need of capital may require such debt relief in the existing capital structure. Relatively large subsidiaries would impose a greater strain on the internal capital market, but would also raise more cash when only a minority portion is offered in the IPO. In either case, a minority carve-out represents a compromise between the status quo and the other divestiture choices studied here. In this report, minority carve-outs are only included when a future spin-off is neither associated with the carve-out nor anticipated at the time of filing, based on a review of public announcements.

If the twenty percent threshold is surpassed but less than fifty percent of the subsidiary is offered to the market, then the parent is assured control of the subsidiary although any tax advantages have been lost. A subsequent spin-off cannot be a tax-free distribution to shareholders. Between these levels of divesting, there can still be consolidation from an accounting standpoint that would allow management of cash flows and expenses between the parent and the subsidiary. It is unclear how much of this overlap could be ascertained through the disclosure required for the IPO process. However, it is expected that the losses of the tax advantage and the spin-off option are costly and therefore, the intermediate fractional carve-outs must correspond to

situations of greater cash constraint and more substantial missed growth opportunities than the minority offerings.

When more than fifty percent of the subsidiary is divested, the parent has chosen to greatly reduce the dependence of the subsidiary on the parent's management structure, whether or not absolute control has been relinquished. From an operational standpoint following the divestiture, this sample of carve-outs is the most similar to the spin-offs in the study. The valuation and cash constraint arguments are most likely to surface in this comparison. Unrelated subsidiaries might also be expected in majority carve-outs, however, based on the findings of Reeves (1999). As we move along the fractional dimension from lower proportions of the severed division offered for sale to these increased stakes, the effects related to the hypotheses set out above may exert a changing influence on the divestiture decision.

## 2.4 Data and Methodology

The SDC data source is used to identify a global set of 1018 spin-offs and 746 carve-outs in the period from 1980 to 2003, before further screening of the data. Though no focused effort has been made to work solely with U.S. firms, the database matching does restrict most of the final sample of 458 spin-offs and 292 carve-outs to this jurisdiction. The original records are first matched to Compustat using the SDC six-digit CUSIP identifier for the parent company, and then unmatched or inconsistent records are manually reviewed for a positive identification. Missing market values for parent firms are filled using the CRSP data for fiscal year-end valuations. Finally,

CUSIP identifiers are used to link the records to the IBES data to determine the appropriate analyst following for the parent firms in the year of divestiture and to link marginal tax-rates supplied by John Graham, calculated using his published procedure (Graham (1996)).[8]

In cases where multiple spin-offs involved the same parent and announcement date, the divestitures are combined into a single record. For combination carve-out/spin-offs with concurrent file/announcement dates, both records are removed. Spin-offs that referenced previous carve-outs are also removed, since the asymmetric information and cost arguments have been resolved at the time of the original minority carve-out. The remaining sample consists of 458 spin-offs and 292 carve-outs. From Table 2.1, which indicates the timing of these divestitures in our testing period from 1980-2003, we can see that most of the data is collected from 1983-2002. This does match the relative frequency from the greater original dataset quite well, however, as indicated by comparison of the percent identified in each year (columns 3 and 6) with the percent of the original total (columns 4 and 7) in the table.

[8] These data were provided through John Graham's website, where they are regularly updated, and thus coverage is complete in the entire period of our study.

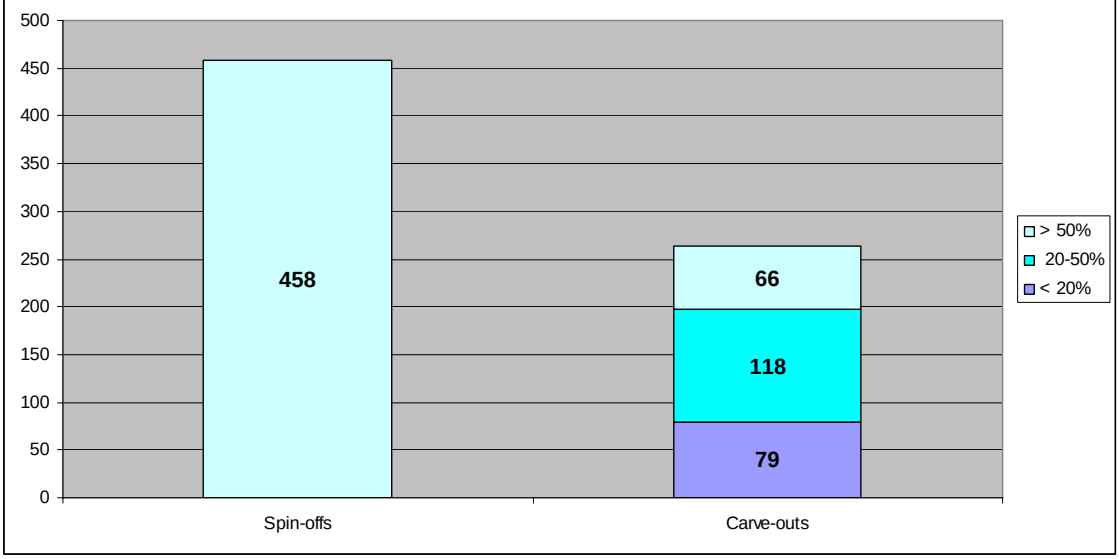
## Table 2.1: Divestiture Frequency with respect to Time

From a search of the SDC database, all spin-offs and carve-outs are identified in the period of our study, 1980 to 2003. Divestiture records are then matched to Compustat, CRSP, and IBES databases to collect the desired independent variables, which reduced the sample to 458 spin-offs and 292 carve-outs that are entered into our logistic regression framework. This table indicates the timing of the transactions and the percentage of transactions in each year in the 'Percent' column. The '%Total' column contains the yearly percentage of transactions with respect to the original 1018 spin-offs and 746 carve-outs, to allow comparison. The relative distribution over time is not substantially changed in the data selection process.

| **Year** | **Carve-outs** | | | **Spin-offs** | | | **Total** |
|---|---|---|---|---|---|---|---|
| | Number | Percent | %Total | Number | Percent | %Total | |
| 1980 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 2.0 | 1 | 0.2 | 0.2 | 1 |
| 1982 | 0 | 0 | 2.9 | 2 | 0.4 | 0.4 | 2 |
| 1983 | 23 | 7.9 | 7.3 | 6 | 1.3 | 1.8 | 29 |
| 1984 | 14 | 4.8 | 4.4 | 7 | 1.5 | 1.8 | 21 |
| 1985 | 17 | 5.8 | 5.6 | 15 | 3.3 | 2.8 | 32 |
| 1986 | 27 | 9.3 | 8.1 | 20 | 4.4 | 4.1 | 47 |
| 1987 | 16 | 5.5 | 5.4 | 19 | 4.2 | 3.7 | 35 |
| 1988 | 9 | 3.1 | 4.4 | 21 | 4.6 | 4.2 | 30 |
| 1989 | 8 | 2.7 | 2.2 | 21 | 4.6 | 3.7 | 29 |
| 1990 | 5 | 1.7 | 1.7 | 22 | 4.8 | 4.9 | 27 |
| 1991 | 20 | 6.9 | 6.6 | 12 | 2.6 | 2.6 | 32 |
| 1992 | 21 | 7.2 | 6.6 | 22 | 4.8 | 4.4 | 43 |
| 1993 | 22 | 7.5 | 8.1 | 26 | 5.7 | 5.5 | 48 |
| 1994 | 12 | 4.1 | 4.4 | 23 | 5.0 | 4.4 | 35 |
| 1995 | 13 | 4.5 | 4.2 | 29 | 6.3 | 7.2 | 42 |
| 1996 | 23 | 7.9 | 6.6 | 30 | 6.6 | 6.5 | 53 |
| 1997 | 7 | 2.4 | 2.9 | 33 | 7.2 | 7.8 | 40 |
| 1998 | 14 | 4.8 | 4.4 | 39 | 8.5 | 8.5 | 53 |
| 1999 | 12 | 4.1 | 4.2 | 34 | 7.4 | 7.4 | 46 |
| 2000 | 13 | 4.5 | 4.2 | 44 | 9.6 | 10.9 | 57 |
| 2001 | 8 | 2.7 | 2.9 | 15 | 3.3 | 3.9 | 23 |
| 2002 | 7 | 2.4 | 1.7 | 17 | 3.7 | 3.6 | 24 |
| 2003 | 1 | 0.3 | 0.2 | 0 | 0 | 0 | 1 |
| **Total** | 292 | 100 | 100 | 458 | 100 | 100 | 750 |

The SDC data allow consideration of the amount of the subordinate division carved out by the parent. Where this information is missing from that source, data are filled by searching in Lexis Nexis and the Wall Street Journal Index. Similar to Reeves (1999), we segregate the carve-out data into three categories: a) less than 20% of the subsidiary is carved out, without mention of a subsequent spin-off, b) between 20% and 50% is issued, resulting in the loss of any tax advantages but guaranteeing retained control by the parent, and c) greater than 50% of the subsidiary is offered to the market, where control may be sacrificed[9]. Figure 2.1 illustrates how the entire sample of divestitures is broken down in this respect.[10]

**Figure 2.1: Data Separated by Carve-out Fraction**




[9] If the remaining shares are widely held, control can be retained with a lesser holding, but 50% provides a convenient reference point in all cases, as control is surely retained if less is offered to the market.

[10] The total sample of carve-outs includes 292 observations, but in 29 cases, the carve-out fraction could not be determined and these remain coded as missing. These transactions are found to be somewhat smaller than the remaining observations, but otherwise the data are unremarkable.

The developed hypotheses to be tested use two sets of logistic regressions, as described in equation (1). In the first case, the response variable ($\pi$) takes the value 0 if a spin-off is chosen and the value 1 if a carve-out is chosen, regardless of the fractional amount offered to the market. Then, a multiple logistic framework is used to analyze the relationship with respect to the amount of the subsidiary that is offered in the IPO. For this model, the spin-off continues to be coded as 0, while the carve-out fractions are coded 1, 2, and 3, in order of increasing proportion offered in the IPO. With a multinomial logit, the ordering does not have the same significance as the ordered probit model; rather it simply separates the equity carve-out classifications, which best suits the purpose of this work. A priori, no expectation of greater influence exists that is dependent on the order of the fractions chosen.

Logit model:

$$\pi_j = \beta_0 + \beta_{1A}(\text{reputation})_j + \beta_{1B}(\text{information})_j + \beta_{2i}(\text{cash}_i)_j + \beta_3(\text{related})_j + \beta_{4i}Z_{ij} + \varepsilon_j \quad (1)$$

where $\pi_j = \log\left(\frac{P_j}{1-P_j}\right)$, and $P_j$ = is the probability of the carve-out decision;

the $(\text{reputation})_j$ effect is estimated by proxies of firm size or age;
the $(\text{information})_j$ effect is measured by analyst following;
the $(\text{cash}_i)_j$ effects are estimated by accounting measures of leverage, cash flow, capital expenditures, and Tobin's Q;
the $(\text{related})_j$ effect is an indicator of a 2-digit primary SIC match;
$Z_{ij}$ are control factors of marginal tax rates, year, relative subsidiary size, etc.;
and $\varepsilon_j$ are the error terms.

The cross-correlations between all of the independent variables are calculated and reported in Table 2.2. Potential for concerns of multi-collinearity that might affect the logistic regression model fitting are indicated in bold-face type font. Significance levels are not reported as most of the pair-wise correlations are highly significant.

## Table 2.2: Correlation Table of Independent Variables

For a sample of 458 spin-offs and 292 carve-outs in the period of 1980 to 2003, thirteen potential variables are considered to estimate the probable choice of divestiture method in a logistic regression framework. The Pearson correlation coefficients between these variables are included in the table. Size is the natural logarithm of market value of the parent firm in the year of divestiture. Analyst Follow is the number of financial analysts following the parent firm from IBES, divided by the logarithm of its total assets. Age is the duration from the first record of the parent firm until the transaction announcement date. Δ Cash Flow is the change in cash flow from the previous year to the year of the announcement. Δ Cap. Expend is the change in capital expenditures from the previous year to the year of the announcement. Cash flow over TA (cf/TA) is the cash flow in the year of divestiture divided by total assets of the parent. Tot Debt Ratio (TDR) is the trimmed total debt ratio taken from Compustat. LT Debt Ratio (LDR) is trimmed financial leverage, defined as long term debt over shareholder's equity. Relative Size is the market value of the subsidiary divided by the market value of the parent. Market to Book (M/B0 is the market to book ratio for the parent firm. Return on Assets (ROA) is the return on assets for the parent firm. Marginal Tax is the parent firm's marginal tax rate from John Graham's website calculated in accordance with his published method (Graham (1993)). Tobin Q is Tobin's Q ratio of market value and net liability divided by the book value of assets. Bold-faced entries indicate potential concerns for multi-collinearity in the independent variable data.

| | Analyst Follow | Age | Δ Cash Flow | Δ Cap. Expend | cf/TA | TDR | LDR | Relative Size | M/B | ROA | Marginal Tax | Tobin Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | **.5981** | **.4650** | -.0055 | .1203 | **.3565** | -.0821 | -.0699 | -.2627 | **.3298** | **.3577** | .1110 | **.3582** |
| Analyst Follow | | .2053 | .0350 | .0663 | .2982 | -.1341 | -.1042 | -.1282 | .1726 | .2929 | .1328 | .2680 |
| Age | . | | -.0249 | .0392 | .2371 | .0759 | .0837 | -.1190 | -.0640 | .1978 | .0971 | -.1301 |
| Δ Cash Flow | | | | .1169 | .0956 | .1001 | .0447 | .0174 | .0613 | .1112 | -.0538 | .0392 |
| Δ Cap. Expend | | | | | .0408 | -.1062 | -.0849 | -.0059 | .0620 | .0593 | .0623 | .0403 |
| cash flow over TA | | | | | | -.1350 | -.1933 | -.0130 | .1466 | **.9622** | .2623 | .1391 |
| Tot Debt Ratio | | | | | | | **.7507** | .0125 | -.0019 | -.1182 | -.0960 | -.2690 |
| LT Debt Ratio | | | | | | | | -.0289 | .2053 | -.1812 | -.0687 | -.1664 |
| Relative Size | | | | | | | | | -.0580 | .0187 | -.1191 | -.1157 |
| Market to Book | | | | | | | | | | .1688 | .0096 | **.7037** |
| Return on Assets | | | | | | | | | | | .2560 | .1507 |
| Marginal Tax Rate | | | | | | | | | | | | .0318 |

By coding the spin-off as zero and carve-out as one, positive coefficients in the logistic regressions will indicate all factors supporting a carve-out decision. Thus, Hypothesis I is confirmed by a large negative constant term remaining in the logistic regression when other factors have been estimated.

The positive influence of reputation as it affects fair valuation in the IPO can be identified by using one of three proxy variables that correspond to this characteristic: 1) firm size entered as the logarithm of market value, 2) firm age prior to the spin-off announcement[11], and 3) the bond rating of the firm. To avoid collinearity, the multidimensional criteria incorporated in bond ratings are intended to establish the best measure of firm reputation. However, ratings are selective and somewhat pessimistic evaluations of the firms and in this study, they are unavailable for a large number of companies. Beyond a univariate analysis of the data, the bond ratings cannot be used without greatly reducing the data. Firm size and firm age remain as suitable proxies for firm reputation to establish the effect posed in Hypothesis IIA.

Available information in the external market is captured by the financial analyst following of the firm, divided by the logarithm of total assets. For Hypothesis IIB, the relative cost of information is inversely related to the monitoring function carried out by financial analysts, which is only considered when age is the first proxy. A significant positive coefficient is expected for both age and analyst following as their

[11] The variable corresponds to the age of the parent as it is known at the time of announcement/filing. The company may have been in existence much longer, but the date used corresponds to the first use of the current name and CUSIP identifier, together.

impact should support a carve-out divestiture, due to a positive correspondence to fair valuation and an expected inverse relationship with information asymmetry.

Although firm size is also an indicator of available information, it has been included in the related but more general characteristic of reputation, or being well known. From Table 2.2, it can be seen that firm size is highly correlated with both analyst following and age, but age and analyst following are much less dependent on one another. Therefore models including firm size are considered apart from models containing both age and analyst following.[12] The determination of the effect of asymmetric information remains confounded with the effect of reputation in the 'size' regressions.

To test Hypothesis III, leverage, cash flow, and growth opportunities are all entered into the model as indicators of the past, present, and future need for cash.

If either of the two leverage variables is entered in each logistic regression,[13] then the past use of borrowing for investment opportunities is captured. To measure the overall debt effect, the total debt to total assets ratio is included, after trimming the Compustat raw data values beyond 150 and recoding those between 100 and 150 to 100%. Alternatively, leverage defined as long-term debt to shareholders' equity is included to ascertain if the impact results from established debt or recent adjustment to the debt in the capital structure, as suggested by Pagano et al (1998). All of the outlying leverage

[12] The alternative method of principle component decomposition does not suit our purpose of assigning quantitative effects to known attributes.
[13] As a robustness test, long term debt over total assets was also considered and found to be highly correlated with the total debt ratio.

values are trimmed at 5,000 to reduce high influence points resulting from extremely small equity positions. Of the two measures, total debt ratio is expected to provide a stronger relationship, since the short-term portion of borrowing is more likely to have been committed to the immediate and promising growth prospects of the subsidiary.

A preliminary study of available accounting information provided by Compustat indicates that a suitable direct measure of constrained investment needs to be formulated, since the pre-calculated funds flow adequacy ratio is unavailable for a large number of firms. To determine whether further investments in the division are becoming unsustainable, cash flow and capital expenditures are measured. Three variables are included: 1) percentage change in annual cash flow in the year of divestiture, 2) percentage change in annual capital expenditures in the year of divestiture, and 3) the difference between capital expenditures in the given year (t) of divestiture and cash flow from the previous year (t-1) normalized by total assets, as suggested by Anderson (2002).

Tobin's Q provides the indicator of future growth prospects. In this case, we follow the method of Gertner et al. (2001) and use the proxy ratio of market value of the firm and net liability over the total book value of assets, as shown in equation (2). Market value of the firm is calculated as the sum of common equity and the liquidation value of preferred stock (LVPS) and net liability is the sum of current liabilities and long-term debt less current assets.

$$Q = \frac{\left[(CommonEquity + LVPS) + (CurrentLiabilities - CurrentAssets + LongTermDebt)\right]}{TotalAssets} \qquad (2)$$

Hypothesis IV requires a measure of relatedness, which is estimated by matching of the first two digits of the primary Standard Industrial Classification (SIC) codes. This screening is updated by our subjective view as to whether the resultant firms are in related businesses.[14] As noted in previous studies (Reeves(1999), Gertner et al(2002)), operations capable of vertically integrating may be classified as different using SIC codes. The relatedness characteristic is entered as an indicator variable that is unity if firms and subsidiaries are related, zero otherwise.

Several firm performance measures are included as control values to reduce the potential of a missing variable in the logistic framework. Market to book ratio, P/E ratio, return on assets (ROA), and cash flow normalized by total assets are all entered as control variables. The number of variables is subsequently reduced to maintain a suitable sample size and to eliminate concerns of cross-correlation. Due to a paucity of data and lack of any significant effect, the P/E ratio is removed from the model. As expected, the ratio of cash flow to total assets is highly correlated with ROA, so these variables are only entered separately into the logistic regressions. Cash flow over total assets is retained and reported in the remaining sections since it is available for a greater number of firms and it is consistently a better predictor of divestiture choice.

[14] A robustness check of replacing and re-estimation of the model was carried out and the subjective procedure does not materially affect the results.

The performance measure of market value to book value of assets is very similar to Tobin's Q and these are found to be highly correlated. In the regression results, the Tobin's Q measure is included since the data again provide more coverage for the parent firms and the net effect is found to be greater. From a purely empirical standpoint, this raises a minor concern since market influences cannot be reasonably separated from growth prospects.

Other control variables have been introduced in the model as the logit technique does suffer from the missing variable problem (Greene (2000). The relative size of the subsidiary is entered in the model to establish any influence that might be related to cash constraint, available information, or liquidity. A larger division will place increased pressure on the internal capital market and parent's resources. A larger division will necessarily attract more attention from the parent's analyst following, tending to make information on the subsidiary itself cheaper with respect to an equity carve-out IPO. A larger division will also require greater market demand to float a public offering, creating a liquidity effect relating to subsidiary size as suggested by Shleifer and Vishny (1992).[15] As with firm size, there are several effects that correspond to this variable and thus attributing the results to any single aspect would be inappropriate.

To control for tax considerations in the choice of divestiture, marginal tax rates explicitly calculated in accordance with Graham's (1996) procedure have been included

[15] See also Schlingemann, Stulz, and Walkling (2002).

as a control variable. This independent variable is included as a control since it is difficult to insert into our real option framework. The impact of taxation is primarily an adjustment of the effective discount rate of cash flows received in the IPO transaction. Although we have monitored several variables that would impact the discount rate, herein no attempt has been made to establish an exact theoretical model relative to the divestiture decision. The taxation level of a firm is likely to affect the divestiture decision, however, since the tax-free spin-off avoids additional expenses at the time of divestiture.

The final variable entered in the regressions corresponds to the timing of the divestiture by year, relative to 1993, which is the approximate midpoint of our data. The variable is included to indicate whether a certain method has become more popular over time. This variable may reflect whether evaluation by the external capital market has become more important in recent years, corresponding to a higher incidence of carve-outs recently. Alternatively, emphasis on analyst reporting has also increased in recent years, corporate tax rates have dropped over the period of study, and the market valuation of corporations has increased in this timeframe. Thus the time variable has been included to capture these latent effects that might otherwise contribute to increased variation in the residual error estimates.

## 2.5 Discussion of Results

UNIVARIATE ANALYSIS

The univariate summary statistics for the spin-off and aggregate carve-out sample are calculated and Wilcoxon rank-sum (Mann-Whitney) nonparametric tests establish whether the spin-off data are significantly different from the carve-out data for the independent variables of interest. The averages of the fractional subsets of the carve-out data are compared across all variables using Tukey's test for multiple mean comparisons. In these tests, only age indicates a significant difference in these subsets, where the mean age of the majority carve-out parents lies significantly above the mean age of those parents splitting off between twenty and fifty percent. As such the tabulated results are not presented herein.

Table 2.3 provides the description of the potential variables from a univariate perspective comparing the statistical measures of the spin-off and the carve-out sub-samples. Transaction values from carve-out filings are listed for completeness. These dollar values indicate the magnitude of the IPO in the market, but the data are less useful for comparison with the spin-off data, as they represent only a fraction of the subsidiary's size. The average carve-out transaction is about one-fifth the size of the average spin-off, varying across a range of carve-out fractions. When the data are corrected to reflect the size of the subsidiary, no significant difference is found between the mean cash values of the spin-off and carve-out samples using the nonparametric Wilcoxon rank-sum test. Similarly, there is no evidence that the market value of the parent differs between these groups. When the relative size of the subsidiary with

## Table 2.3: Comparison of Univariate Data for Spin-off and Carve-out Samples

From data on 458 spin-offs and 292 carve-outs in the period of 1980 to 2003, the univariate statistics and rank sum tests are estimated for each independent variable to indicate significant differences between spin-off and carve-out samples. Transaction Value is value of the divestiture transaction in the SDC database. Subsidiary Size is the transaction value for the spin-off and the transaction value divided by the fraction of the subsidiary offered to the public for the carve-out. Market Value of Parent is the market value of the parent firm in the year of divestiture from Compustat or CRSP. Subsidiary Relative Size is the market value of the subsidiary divided by the market value of the parent. Parent Age is the duration from the first record of the parent firm until the transaction announcement date. Bond Rating is the Standard and Poors bond rating of the parent from Compustat. Analyst Following is the number of financial analysts following the parent firm from IBES. Analyst over log(TA) is the number of analysts divided by the logarithm of the parent's total assets. Parent Cash Flow is the parent's cash flow in the year of the divestiture announcement. Capital Expend. is the parent's capital expenditures in the year of the announcement. Total Debt Ratio is the trimmed total debt ratio taken from Compustat. Long Term Debt Ratio is trimmed financial leverage, defined as long term debt over shareholder's equity. Tobin's Q Ratio is the sum of market value and net liability divided by the book value of assets. Market to Book Ratio, Price over Earnings, and Return on Assets are accounting ratios for the parent firm from Compustat. Marginal Tax Rate is the parent firm's marginal tax rate from John Graham's website calculated in accordance with his published method (Graham (1993)). Bold-face entries indicate that the Wilcoxon Rank Sum (Mann-Whitney U) Test provides evidence that the samples differ significantly at the 5% level, with the actual probabilities included in the parentheses. Where the score is negative, the spin-off sample displays a higher rank and where positive, the carve-out rank is greater.

| **Variable *** | **Rank sum** | **Spin-offs** | | | | **Carve-outs** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Stat (prob)** | **N** | **Min** | **Mean (Med)** | **Max** | **N** | **Min** | **Mean (Med)** | **Max** |
| Transaction Value ($M) | N/A | 350 | 0.06 | 1,108 (154.4) | 59,973 | 292 | 1.8 | 216 (42) | 9,027 |
| Subsidiary Size ($M) | -0.56 (0.573) | 350 | 0.06 | 1,108 (154.4) | 59,973 | 242 | 3.25 | 1,094 (139.3) | 57,865 |
| Market Value of Parent ($M) | -1.55 (0.121) | 419 | 0.12 | 6,767 (684) | 515,110 | 238 | 2.89 | 7,772 (448.6) | 460,304 |
| **Subsidiary Relative Size** | **5.11 (0.000)** | 312 | 0.07 % | 62.3 % (19) | 3919% | 199 | 0.63 % | 153 % (33.9) | 4578% |
| **Parent Age** | **-2.63 (0.009)** | 458 | 0 | 12.2 (11) | 35 | 292 | 0 | 10.6 (9) | 34 |
| **Bond Rating** | **-2.05 (0.040)** | 130 | D | BBB+ | AAA | 95 | D | BBB | AAA |
| Analyst Following | 1.30 (0.194) | 371 | 0 | 11 (7) | 63 | 227 | 1 | 12 (7) | 54 |
| **Analyst over log(TA)** | **2.01 (0.045)** | 367 | 0 | 1.404 (1.043) | 3.678 | 225 | 0.094 | 1.609 (1.191) | 11.48 |
| **Parent Cash Flow ($M)** | **-2.51 (0.012)** | 433 | -406 | 521.5 (54.3) | 22,180 | 276 | -902 | 467.9 (25.7) | 16,701 |
| Capital Expend. ($M) | -1.62 (0.106) | 410 | 0 | 407.8 (43.8) | 17,465 | 238 | 0 | 341.5 (24.6) | 14,306 |
| **Total Debt Ratio** | **4.05 (0.000)** | 430 | 0 | 27.7 (26.0) | 100 | 244 | 0 | 35.3 (32.0) | 100 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Long Term Debt Ratio** | **3.62 (0.000)** | 417 | 0 | 104.9 (43.6) | 5,000 | 230 | 0 | 144.2 (64.1) | 4,580 |
| Tobin's Q Ratio | -1.66 (0.098) | 357 | 0.04 | 1.48 (0.91) | 27.38 | 198 | 0.08 | 1.42 (0.80) | 20.87 |
| Market to Book Ratio | -0.77 (0.440) | 339 | 0.11 | 3.45 (1.99) | 42.3 | 164 | 0.49 | 3.13 (1.99) | 27.1 |
| Price over Earnings | -1.27 (0.204) | 149 | 4.32 | 38.1 (23.2) | 473.2 | 54 | 5.15 | 28.1 (21) | 179.8 |
| **Return on Assets** | **-2.45 (0.014)** | 418 | -124.6 | 1.59 (3.21) | 27.11 | 235 | -353.4 | -1.85 (2.11) | 40.23 |
| Marginal Tax Rate | -0.96 (0.339) | 414 | 0 | .2101 (.3106) | .46 | 249 | 0 | .2021 (.2740) | .46 |

respect to the size of the parent is considered, however, the carve-out offspring are significantly larger on average. This result may point to a situation where an internal capital market is stretched to provide investment funding for a larger division within the parent, imposing a more serious cash constraint. Otherwise, it could provide evidence of a situation where a large transaction cannot be easily offered into the external capital market and the ability to offer a fraction of the subsidiary to investors holds real value by avoiding any price depression in the marketplace. Although the net price reduction for the spin-off would not be immediately felt, those shares would eventually enter the market. The fractional offering in a carve-out might eliminate any adverse effect relating to the liquidity of the stock flotation.

Beyond size, the variables that describe firm reputation are age and bond rating. The ages of parents that spin-off a subsidiary are significantly higher than those that carve-out a division. This result is unexpected and opposite to the age-related prediction of Hypothesis IIA. Also unforeseen is the similar result that the carve-out parents have lower bond ratings than the spin-off parents, but this may relate to a pessimistic

evaluation of the higher debt ratios also associated with the carve-out sample, as described below. Otherwise, the carve-out parents are more in need of the cash and this may already be known to the rating agencies and the market. Data for bond ratings are scarce, however, with the sample size for those firms selected for ratings reduced by more than two thirds. In order to avoid restriction of our results to a much smaller sample of larger corporations, the bond rating measure is not considered beyond the univariate analysis.

Information availability is directly related to financial analysis widely reported for the parent firm, which is related to the number of analysts that follow a company as measured by IBES. When analyst following is considered only with respect to the number of analysts engaged, there is no significant difference between the sample of carve-outs and the sample of spin-offs. However, when the number is standardized with respect to firm size, measured as the logarithm of total assets, the relative number of analysts is greater for those firms that subsequently divest in an IPO, providing support for the information argument to be tested through Hypothesis IIB. Less costly information and relative transparency should translate into a fair valuation in the public offering and support a carve-out.

For the measures of cash flow and constraint, the spin-off parents indicate a healthier financial position: both debt ratios are significantly lower, cash flow is significantly higher, and capital expenditures are higher at p=.106, just beyond the ten percent significance level. The average long term debt ratio for spin-off parents is highly

influenced by extreme values, but, as noted above, long term debt may not reflect the current cash constraint for the firm. Indeed, greater long term debt might illustrate that the parent has sufficient financing to allow the spin-off's embedded call option to mature.

The Tobin's Q measure for the spin-off sample is also higher and significant, just below the ten percent critical value. This suggests that project financing has been less affected in this sample of firms and that cash constraint has not limited the investment in growth opportunities.

Other performance measures considered as controls provide similar information. Market to book ratio is similar to Tobin's Q, but in this study it has a less significant effect and it is recorded in the Compustat database for fewer firms than Tobin's Q, which is calculated here directly from more basic data. Return on assets is markedly higher for the spin-off parents. This difference provides explanatory power in the logistic regressions as well, but in the final models, a greater effect is assigned to the normalized cash flow measure (cash flow over total assets). Since these two variables are highly correlated ($\rho$=0.9622), only the cash flow ratio is included in the subsequent regression analysis. The P/E ratio is the final performance measure included as a control variable and Compustat data are scarce in this case as well. The spin-off sample is reduced by two thirds, carve-out data is cut to less than twenty percent. From the statistical test, the P/E ratio makes no significant contribution to the comparison between the groups and this ratio is not considered beyond the univariate comparison.

John Graham's marginal tax rate data provide the final control and the coverage of this data is fairly complete. The results indicate that firms engaging in tax-free spin-offs have higher marginal tax rates as expected, but the difference between spin-off and carve-out parents is not statistically significant. Marginal tax rates are found to be important in the work of Frank and Harden (2001), but the time period of their study is much shorter. Over the duration of this study, there are several reductions to corporate tax rates and the variance due to changing regulation may mask any discernable difference between the samples. The marginal tax rate is included in the subsequent regression analysis.

### AGGREGATE CARVE-OUT REGRESSIONS

The first logistic regressions compare the decision to spin-off a subsidiary with the aggregate carve-out data, combining all of the fractional groups. Therefore, the option to offer only a fraction of the subsidiary to the public in the equity carve-out is suppressed. For these data, the average fraction of the subsidiary that is carved-out is 36.3% (median=30.1%), similar to that found by Reeves (1999). In these regressions, the response variable ($\pi$) is zero if a spin-off was chosen and unity in the case of a carve-out. In Table 2.4, the first two models, (1) and (2), include the variable size with each debt ratio. In the final two columns, models (3n) and (4n) include age and analyst following with each debt ratio, with no tax rate. [16]

[16]The four final models (1, 2, 3n, and 4n) provide the best fit and result from several tests of control variables as described above.

## Table 2.4: Logistic Regressions: Spin-offs and Aggregate Carve-out Data

From data on 458 spin-offs and 292 carve-outs in the period of 1980 to 2003, logistic regressions are estimated based on the choice of divestiture between a spin-off, coded as zero, and a carve-out, coded as one. Size is the logarithm of the market value of the parent firm in the year of divestiture from Compustat or CRSP. Analyst Following is the number of financial analysts following the parent firm from IBES divided by the logarithm of the parent's total assets from Compustat. Age is the duration from the first record of the parent firm until the transaction announcement date. Cash Flow Over TA is the parent's cash flow in the year of the divestiture announcement divided by its total assets. Δ Cash Flow is the change in the parent's cash flow from the previous year to the year of the divestiture announcement. Δ Cap. Expend is the change in the parent's capital expenditures from the previous year to the year of the divestiture announcement. Tot. Debt Ratio is the trimmed total debt ratio defined as total liabilities divided by total assets, taken from Compustat. LT Debt Ratio is trimmed financial leverage, defined as long term debt over shareholder's equity. Related Dummy is an indicator variable that takes value unity if the first two-digits of the SIC code match and takes value zero, otherwise. Relative Size is the market value of the subsidiary divided by the market value of the parent. Tobin's Q Ratio is the sum of market value and net liability divided by the book value of assets. Marginal Tax Rate is the parent firm's marginal tax rate from John Graham's website calculated in accordance with his published method (Graham (1993)). The values presented in the table are the logit coefficient estimates and the z-values in parentheses. Significant is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating 1% significance levels.

| **Variable** | **(1) Size Total Debt** | **(2) Size LT Debt** | **(3) Analyst Age Total Debt** | **(3n) Analyst Age Tot Debt no tax rate** | **(4n) Analyst Age LT Debt no tax rate** |
|---|---|---|---|---|---|
| Size | 0.0913 | 0.1046 | | | |
| | (1.24) | (1.41) | | | |
| Analyst Following | | | **0.1998*** | **.2147**** | **0.2003*** |
| | | | **(1.81)** | **(1.99)** | **(1.85)** |
| Age | | | -0.0063 | -0.0120 | -0.0094 |
| | | | (-0.39) | (-0.77) | (-0.60) |
| Cash Flow Over TA | **-3.424***** | **-3.493***** | **-5.043***** | **-5.168***** | **-5.725***** |
| | **(-2.66)** | **(-2.67)** | **(-3.16)** | **(-3.31)** | **(-3.52)** |
| Δ Cash Flow | 0.0030 | 0.0025 | -0.0233 | -0.0187 | -0.0178 |
| | (0.16) | (0.14) | (-0.87) | (-0.72) | (-0.68) |
| Δ Cap. Expend | 0.0354 | 0.0332 | 0.1008 | 0.1032 | 0.1157 |
| | (0.64) | (0.58) | (1.02) | (1.05) | (1.10) |
| Tot. Debt Ratio | 0.0085 | | 0.0072 | 0.0064 | |
| | (1.35) | | (1.03) | (0.97) | |
| LT Debt Ratio | | -.0003 | | | -.00029 |
| | | (-0.72) | | | (-0.71) |
| Related Dummy | 0.1636 | 0.2485 | 0.1694 | 0.1368 | 0.2063 |
| | (0.64) | (0.95) | (0.62) | (0.52) | (0.78) |
| Relative Size | **0.4763**** | **0.4532**** | **0.2448*** | **0.2823*** | **0.2481*** |
| | **(2.39)** | **(2.29)** | **(1.71)** | **(1.85)** | **(1.76)** |
| Tobin's Q | -0.0819 | -0.1391 | -0.1730 | **-0.2133*** | **-0.2368*** |
| | (-0.71) | (-1.14) | (-1.33) | **(-1.67)** | **(-1.82)** |
| Marginal Tax Rate | -0.3776 | -0.3249 | 0.0889 | | |
| | (-0.48) | (-0.42) | (0.11) | | |
| Year | **-.0511*** | **-0.0578**** | | | |
| | **(-1.78)** | **(-1.99)** | | | |
| Constant | **-1.340**** | **-1.097**** | **-0.761*** | -0.571 | -0.280 |
| | **(-2.36)** | **(-2.07)** | **(-1.66)** | (-1.38) | (-0.79) |
| $\chi^2$ statistic | 38.39 | 31.66 | 32.66 | 37.93 | 35.61 |
| (p-value) | (0.0001) | (0.0009) | (0.0006) | (0.0000) | (0.0000) |
| Pseudo $R^2$ | 0.0840 | 0.0728 | 0.0827 | 0.0879 | 0.0854 |

In the fourth column, model (3) incorporates age, analyst following, and total debt with the marginal tax rate. It is included here to illustrate the loss of significance when compared to model 3n, where tax rate has been removed. This may occur since the regulated tax rates have been dropping with time and the number of analysts following firms has been rising to produce a collinear effect. A strong pair-wise relationship between these two variables cannot be found in Table 2.2, however, suggesting the result is due to a combination of several of the factors.

When the aggregate sample of all carve-outs is considered, the preference towards a spin-off is indicated by the negative constant term, but this constant is most significant in models that include firm size. The highest pseudo-$R^2$ is established in Model (3n), in which total debt ratio is included with age and analyst following. Marginal tax rate has been removed from this model to improve the fit. Higher analyst following and larger relative subsidiary size support the decision to carve-out. The negative effects found for better financial performance, as measured by greater cash flow over total assets and higher Tobin's Q, motivate a spin-off. The aggregate models incorporating firm size fail to identify the reputation/information effect associated with the market value of the parent, but the cash performance measure and relative subsidiary size remain important.

Where age and analyst following are included, the reputation proxy, age, is not significant but the information proxy supports an equity carve-out decision. A high analyst following with respect to firm size implies that information is readily available to investors and an IPO of the subsidiary is likely to be properly valued. In this case, a

carve-out will return appropriate value to the parent. Since the relative number of analysts positively affects divestiture towards a carve-out, Hypothesis IIB is supported. Conversely, less information is available in the case of the spin-off motive, corresponding to the work of Krishnaswami and Subramaniam (1999), where information asymmetry is found to be high prior to spin-off divestiture.

The effect of relative subsidiary size may indicate that the subsidiary is more easily valued by analysts since it has a higher relative importance in the parent firm's operations or that the internal capital market of the carve-out parent is stretched to provide for the subsidiary. These indirect effects provide weak support for Hypotheses IIB and III, respectively. A more thorough interpretation of this result is provided below in the discussion of the multivariate logistic regression results.

Change in cash flow, change in capital expenditures, and Anderson's (2002) ratio[17] involving capital expenditures and lagged cash flow all fail to provide an effect, when included with the relative cash performance variable, cash flow over total assets. The magnitude of the t-statistic for the cash performance measure across all models in Table 2.4 demonstrates that cash constraint is a major factor that drives the divestiture decision towards an equity carve-out, supporting Hypothesis III. Firms with superior cash-related performance will tend to spin-off a subsidiary.

[17] The ratio of lagged cash flow less expenditures provided poor prediction and reproduced effects contained in the change ratios. Therefore it was removed for parsimony.

The Tobin's Q measure is significant below the ten percent level in the two models that include analyst following as an information effect, which also supports Hypothesis III. Spin-off parents seem better able to avail themselves of growth opportunities, whereas cash constraint may restrict the carve-out parents' growth prospects as measured by this proxy variable. A cleaner indicator of growth opportunities might provide a stronger effect, since Tobin's Q will also be affected by strong market demand and market demand should have exactly the opposite effect on the divestiture decision. Thus the significant negative result strongly supports the theory that growth opportunities make the spin-off options more valuable.

Marginal tax rate data are included as a control in this work. In the aggregate regression where size is included as the proxy for firm reputation, the marginal tax rate is found to be insignificant but its inclusion improves the explanatory power of the model. However, in models that include the information effect of analyst following, the marginal tax rate drops further in significance and its inclusion leads to poorer results due to the loss in degrees of freedom. In Table 2.4, model 3 includes the tax rate and the performance measures can be compared directly with model 3n, which does not include the tax control variable. When the marginal tax rate is removed, the Chi-squared statistic is higher, more variation is explained based on the pseudo R-squared, and several of the significant effects have increased z statistics. As noted above, Model 3n in Table 2.4 is the best fit for the aggregate carve-out data.

Finally, the relative year of the divestiture is included as a control variable to determine if the divestiture decision has changed over time. This effect is significant and improves the models that include firm size, but it is insignificant and detracts from the performance of the models with analyst following, due to correlation between relative analyst following and time. We find more analysts involved with this sample of divesting firms in more recent years. The control variable, year, is therefore retained only in future models involving firm size.

### MULTINOMIAL LOGISTIC REGRESSIONS

When the carve-outs are split by the percentage of the subsidiary issued in the IPO, the analysis is best done using a multinomial logistic framework. Carve-out subsidiaries are split into three categories: l) less than 20% retains tax advantages and allows a future tax-free spin-off, 2) from 20% to 50% gives up tax considerations but retains control advantages, and 3) greater than 50% effectively separates the subsidiary from the parent. Each of these categories is then compared to the sample of spin-off firms and the results are presented in Table 2.5. Panel A contains results of the multinomial logistic model where age and analyst following are included and Panel B contains results of the model incorporating firm size.

There is marked improvement in both panels by considering the three separate categories of carve-outs in the response. In five of six equations, the negative constant term indicates that spin-offs are preferred to carve-outs if all other factors are equal between the firms, as predicted in Hypothesis I. Also, the cash constraint effect consistent with Hypothesis III is evident in all models. Similar to the findings of

Reeves (1999), the richest results lie in the extremes for models of minority and majority carve-outs, described in more detail below.

Throughout all models in Table 2.5, the performance ratio of cash flow over total assets is negative and significant, which supports the choice of a spin-off over a carve-out. Thus, if the parent is performing well on the basis of cash flow, then the expectation of continued success provides additional value to the call option of the spin-off and this divestiture route is preferred. Immediate access to cash is not valued highly enough in terms of rate of return to justify the additional costs of the carve-out IPO. When financial performance is less healthy, as measured by the ratio of cash flow to total assets, a carve-out will be considered. This result strongly supports Hypothesis III, and is consistent with most previous studies of carve-outs.[18] In the multinomial model, the cash flow performance demonstrates a greater effect as the fraction of the offering increases, moving from left to right across the columns in Table 2.5, Panel A. There is a similar but less pronounced effect in Panel B. Thus cash constraint is driving the decision to carve-out a subsidiary and greater need for cash results in a greater fraction offered in the IPO.

Beyond the cash flow measure, each fractional carve-out category depends on the chosen variables to different extents. For minority carve-outs, where less than 20% is offered, analyst following and size have significant positive effects towards choosing a carve-out. The Table 2.5, Panel A results continue to indicate an information effect

[18] See Allen and McConnell (1998), Anderson (2002), or Frank and Harden (2001).

## Table 2.5: Multinomial Logistic Regression Separating Carve-out Fractions

From data on 458 spin-offs and 292 carve-outs in the period of 1980 to 2003, multinomial logistic regressions are estimated based on the choice of divestiture between a spin-off, coded as zero, and three fractional carve-out sub-samples, coded as one, two, and three. In Panel A, models 5a, 5b, and 5c are simultaneously estimated, comparing the carve-out fractions to the spin-offs, and model 3n is reproduced for comparison. Similarly in Panel B, models 6a, 6b, and 6c are simultaneously estimated, and model 1 is reproduced for comparison. Analyst Following is the number of financial analysts following the parent firm from IBES divided by the logarithm of the parent's total assets from Compustat. Age is the duration from the first record of the parent firm until the transaction announcement date. Cash Flow Over TA is the parent's cash flow in the year of the divestiture announcement divided by its total assets. Δ Cash Flow is the change in the parent's cash flow from the previous year to the year of the divestiture announcement. Δ Cap. Expend is the change in the parent's capital expenditures from the previous year to the year of the divestiture announcement. Tot. Debt Ratio is the trimmed total debt ratio defined as total liabilities divided by total assets, taken from Compustat. Related Dummy is an indicator variable that takes value unity if the first two-digits of the SIC code match and takes value zero, otherwise. Relative Size is the market value of the subsidiary divided by the market value of the parent. Tobin's Q Ratio is the sum of market value and net liability divided by the book value of assets. Size is the logarithm of the market value of the parent firm in the year of divestiture from Compustat or CRSP. Marginal Tax Rate is the parent firm's marginal tax rate from John Graham's website calculated in accordance with his published method (Graham (1993)). Year is the difference between the year of the transaction announcement and 1993, the approximate midpoint of the data. The values presented in the table are the logit coefficient estimates and the z-values in parentheses. Significance is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating 1% levels.

**PANEL A: RESULTS WITH AGE & ANALYST FOLLOWING**

| **Variable** | **(5a) < 20% Offered** | **(5b) 20-50% Offered** | **(5c) > 50% Offered** | **(3n) Aggregate Carve-out Data** |
|---|---|---|---|---|
| Analyst Following | **0.2676*** **(1.70)** | 0.1397 (0.92) | 0.2768 (1.55) | **.2147**** **(1.99)** |
| Age | -0.0198 (-0.81) | -0.0281 (-1.25) | 0.0209 (0.80) | -0.0120 (-0.77) |
| Cash Flow Over TA | **-4.545**** **(-2.17)** | **-4.902***** **(-2.65)** | **-6.192***** **(-2.88)** | **-5.168***** **(-3.31)** |
| Δ Cash Flow | -0.0342 (-0.82) | 0.0616 (0.87) | **-0.0562*** **(-1.73)** | -0.0187 (-0.72) |
| Δ Cap. Expend | 0.5199 (1.58) | 0.0479 (0.55) | 0.0782 (0.55) | 0.1032 (1.05) |
| Tot. Debt Ratio | 0.0017 (0.17) | 0.0045 (0.48) | **0.0175*** **(1.74)** | 0.0064 (0.97) |
| Related Dummy | **0.6389*** **(1.69)** | -0.1438 (-0.39) | -0.2046 (-0.45) | 0.1368 (0.52) |
| Relative Size | **0.4272**** **(2.43)** | 0.0930 (0.43) | 0.2702 (1.42) | **0.2823*** **(1.85)** |
| Tobin's Q | -0.1696 (-0.89) | -0.3156 (-1.63) | -0.1263 (-0.60) | **-0.2133*** **(-1.67)** |
| Constant | **-1.921***** **(-3.07)** | -0.775 (-1.37) | **-2.855***** **(-4.07)** | -0.571 (-1.38) |
| $\chi^2$ statistic | 63.22 | | | 37.93 |
| (p-value) | (0.0001) | | | (0.0000) |
| Pseudo $R^2$ | 0.0926 | | | 0.0879 |

**PANEL B: RESULTS WITH PARENT FIRM SIZE**

| Variable | (6a) < 20% Offered | (6b) 20-50% Offered | (6c) > 50% Offered | (1) Aggregate Carve-out Data |
|---|---|---|---|---|
| Size | **0.2597**** | -0.0976 | 0.2122 | 0.0913 |
| | **(2.16)** | (-0.99) | (1.64) | (1.24) |
| Cash Flow Over TA | **-3.392*** | **-2.832*** | **-3.985**** | **-3.424***** |
| | **(-1.75)** | **(-1.85)** | **(-2.29)** | **(-2.66)** |
| Δ Cash Flow | 0.0238 | 0.0122 | **-0.0513*** | 0.0030 |
| | (0.90) | (0.41) | **(-1.69)** | (0.16) |
| Δ Cap. Expend | **0.6846*** | 0.0174 | 0.0112 | 0.0354 |
| | **(1.96)** | (0.29) | (0.15) | (0.64) |
| Tot. Debt Ratio | 0.0005 | 0.0116 | 0.0166 | 0.0085 |
| | (0.05) | (1.46) | (1.56) | (1.35) |
| Related Dummy | **0.8329**** | -0.2465 | -0.0481 | 0.1636 |
| | **(2.10)** | (-0.68) | (-0.11) | (0.64) |
| Relative Size | **0.8825***** | 0.3673 | -0.0564 | **0.4763**** |
| | **(3.44)** | (1.51) | (-0.12) | **(2.39)** |
| Tobin's Q | -0.048 | -0.0283 | -0.1844 | -0.0819 |
| | (-0.27) | (-0.19) | (-0.86) | (-0.71) |
| Marginal Tax Rate | -1.5061 | 1.0341 | -1.609 | -0.3776 |
| | (-1.22) | (0.95) | (-1.20) | (-0.48) |
| Year | **-0.1260**** | -0.0175 | -0.0525 | **-.0511*** |
| | **(-2.58)** | (-0.46) | (-1.06) | **(-1.78)** |
| Constant | **-3.741***** | **-1.315*** | **-3.172***** | **-1.340**** |
| | **(-3.98)** | **(-1.80)** | **(-3.08)** | **(-2.36)** |
| $\chi^2$ statistic | 84.91 | | | 38.39 |
| (p-value) | (0.0000) | | | (0.0001) |
| Pseudo $R^2$ | 0.1174 | | | 0.0840 |

associated with analyst following consistent with Hypothesis IIB and the size effect has gained significance in model 6a of Table 2.5, Panel B, providing evidence to support Hypothesis IIA. Since the parent is well known by the market in either case, the costs of disclosing information in the IPO process are lower for this group of firms and a fair

valuation by the market is more likely. The parents that carve-out a minority stake are either larger or well-followed by analysts.

The sample of minority carve-outs in the Table 2.5, Panel B, 'size' regressions is the only group that indicates a discernable relationship with the annual change in capital expenditures, an effect just beyond conventional significance levels ($z=1.58$, $p=0.115$) in Panel A. The positive result suggests that parents who have recently increased their capital expenditures will carve-out a minority stake in the subsidiary. If the minority offering is required to finance the past investments, then this finding aligns well with the evidence of Pagano et al (1998), though leverage itself has not been found to be a significant predictor. In other words, American public companies are somewhat similar to the Italian private companies studied since the firms' investments have increased, but with the publicly traded parents in the United States, the IPO may be initiated prior to a noticeable effect regarding the debt ratio.

Where the subsidiary is in a similar business as the parent, as indicated by matching of the first two digits of the primary SIC code, the 'related' indicator variable is set to unity; otherwise, it is zero. The multinomial logistic models indicate that a related subsidiary is more likely to be carved-out as a minority stake. This result is the only evidence found with respect to Hypothesis IV, supporting proposition IVB. In cases where greater than twenty percent of the subsidiary is divested, the classification of subsidiary in a related business is found to be ineffectual. Since the minority carve-out does not substantially change the arrangement between the parent and the subsidiary,

the related businesses continue to be efficiently operated as described by Schoar (2002), with the additional benefit of the cash proceeds from the IPO.

For minority carve-outs, the relative size of the subsidiary also displays a significant positive result, such that larger subsidiaries are more likely to have a minority fraction carved-out. This effect is predictable for several reasons. First, financing the larger subsidiary through the internal capital market is more likely to become unwieldy and therefore additional capital must be raised through an IPO. Second, flotation of a minority issue in the external market could provide a method of reducing information asymmetry as described by Nanda and Narayanan (1999), so that fair valuation of the subsidiary apart from the valuation of the comparably-sized parent is possible. Third, offering too great an amount of a large division may result in over-supply in the market and price depression. Thus the minority carve-out may simply be an effective method of providing liquidity for shares of the subsidiary. Thompson & Apilado (2006) study two-stage divestitures and find that the normal IPO under-valuations are not evidenced when a smaller percentage issue is taken to market, having a lesser effect on demand reduction. In addition, the parent retains a substantial interest in the subsidiary that signals its value to the market and continued monitoring is ensured, alleviating a principal-agent concern. This logic coincides with the effect found for relatedness and positions the minority carve-out as a partial measure towards further divestiture.

In the sub-sample of intermediate range carve-outs, involving between 20-50% of the subsidiary, only the cash flow performance measure is negative and significant.

Otherwise, this sample offers very little support for the collected hypotheses. In the regression involving age and analyst following in Table 2.5, Panel A, the Tobin's Q proxy rests just beyond our critical significance level (z=-1.63, p=.103) and provides weak support for our assertion that parents with higher potential growth opportunities will spin-off the subsidiary, rather than offer an intermediate fraction to the public. Due to tax considerations, it is unlikely that a spin-off would follow these intermediate carve-out events. Thus the consideration of growth opportunities at the time of these divestitures might be expected to have a stronger influence in the divestiture decision. Apart from this minor insight, these carve-outs cannot be distinguished easily from spin-offs using the logistic model.

Finally, majority carve-outs are considered, where greater than fifty percent of the subsidiary is offered to the public. In this sample, the cash flow performance measure has its greatest effect, and other indicators of cash constraint also become significant. The percentage change in cash flow from the previous year is negative and significant, which indicates that a sustained effect of poor cash flow performance predicts a majority carve-out, whereas improvement in performance supports a spin-off. The coefficient for total debt ratio is positive and statistically significant in the majority carve-out model that includes analyst following in Table 2.5, Panel A, while it is just beyond significance in the model including size in Panel B. This suggests that borrowing in the debt market has taken place and further financing from the same source might be constrained for these firms. Consistent with the supposition of Allen and McConnell (1998) that only severe cash constraint leads managers to relinquish

control, equity financing is sought only when necessary. The significant effect of the total debt ratio is the only direct support for the finding of Pagano et al (1998) that an investment has already changed the capital structure, and an equity issue is required for rebalancing purposes.

In these carve-outs that are most similar to the complete change of management in tax-free spin-offs, analyst following ($z=1.55$, $p=.121$) and size ($z=1.64$, $p=.118$) are beyond the critical 10% significance level, but each indicates its expected effect. Larger size and higher relative analyst following relate to cheaper costs of providing IPO disclosure information and less under-pricing, in accordance with Hypotheses IIA and IIB. There is weak evidence that information is important to the method of divestiture. The key reason for choosing to divest of more than half of the subsidiary via the IPO route, however, is the need for cash, as suggested by Hypothesis III. A comparison between the significant variables in majority carve-outs versus minority carve-outs provides a clear account of a more constrained parent having exhausted other sources of funding. Capital expenditures have not risen, cash flow has dropped, and there is additional debt in the capital structure. The divestiture via a majority carve-out seems to be less a matter of choice than a matter of financial need.

The marginal tax rate gained in significance through the multinomial framework and it is consistent in its sign, predicting a spin-off for firms with higher tax obligations. This control variable greatly improves the regressions in which firm size is a proxy for a reputation effect, producing results similar to those found with age and analyst

following. However, the marginal tax rate is not as useful when analyst following is included. Since the timeframe of this study covers a number of regulatory tax changes, imposed variance in base corporate tax rates lessens the observed effect that the marginal rates might otherwise have.[19] Additionally, there is time related collinearity in the data that occurs naturally: analyst following has increased with time, sizes of firms have increased with time, and tax rates have decreased with time. These latent effects may confound any noticeable impact of the marginal tax rates. A study of shorter duration, such as that of Frank and Harden (2001), suffers less from these problems, and in that work the marginal tax rate proves to be significant.

## 2.6 Conclusion

This empirical study differentiates parent companies that choose to divest through subsidiary spin-offs from those that prefer equity carve-outs. The results of the logistic regressions using the aggregate carve-out data support the hypothesis that the parent's cash constraint requires a carve-out rather than a spin-off, which confirms the earlier work describing the divestiture decision by Anderson (2002), Frank and Harden (2001), and Reeves (1999). In addition, the model provides strong evidence that available information motivates the carve-out IPO, whereas potential growth opportunities favour divestiture through a spin-off. The option-like value of the spin-off is also included in the findings of Michaely and Shaw (1995), who conclude that smaller, riskier firms choose to spin-off into Master Limited Partnerships. From an investment perspective,

[19] We are grateful to John Graham for allowing access to these rates, which allowed testing of the taxation effect and improved the size regressions greatly.

the potential high return related to purchase of shares anticipating a spin-off stems from uncertainty in the information content regarding the parent firm, in accordance with an efficient capital market.

Results from the multinomial logistic regressions separate the carve-out data into fractions of the subsidiary offered in the IPO, to allow a clearer description among four divestiture choices. Hypothesis I states that a spin-off should be ultimately preferred by a firm based on the costly nature of the IPO process and the need to provide adequate information. The logistic regressions indicate a statistically significant result with a large negative intercept supporting the spin-off choice. The relatively large number of spin-offs in the sample also bolsters this conclusion.

The information effect persists in the multiple logistic tests. In agreement with Hypotheses IIA and IIB, when the firm is better known to the market, a carve-out is more likely. The effect is significant whether size or analyst following is considered in predicting a minority carve-out, and weak evidence is found in the case of a majority carve-out. In this study, age is found to be an unacceptable proxy to establish the firm reputation effect.[20] In future study, another measure of fair valuation might be proposed that compares the parent to other firms in its industry sector, similar to the liquidity measure introduced by Schlingemann et al (2002).

[20] Bond rating was also unsuitable as a proxy variable, since it reduced the dataset substantially.

Hypothesis III focuses directly on financial constraint driving the choice towards an equity carve-out, consistent with the result of Anderson (2002). There is strong evidence of an effect related to cash flow performance (cash flow over total assets) in all logistic regressions. Additionally, cash flow constraint becomes a more important aspect as the percentage of the subsidiary offered in the IPO rises. In majority carve-outs, indicators of more severe cash constraint become significant. Cash flow level, change in cash flow, and total debt ratio all demonstrate effects, consistent with this hypothesis. The effect of debt ratio aligns with the work of Pagano et al (1998), who find that investment has generally been made prior to a public offering. Similarly, Allen and McConnell (1998) indicate that subsidiary performance must influence the parent's operations significantly, before a divestiture that relinquishes control will be undertaken. Thus our findings of greater cash concerns with majority carve-outs rest well with previous work.

Only in the situation of a minority carve-out is there a significant effect from relatedness of the subsidiary's business to that of the parent. In accordance with Hypothesis IVB, a parent is more likely to carve-out a minority stake of a related subsidiary, thus retaining control. Anderson (2002) finds spin-offs more likely when the parent and subsidiary occupy different sectors. For intermediate and majority carve-outs, however, relatedness of parents and subsidiaries does not influence the divestiture decision. This clarifies a prior point of confusion in the literature and may indicate the source of previous uncertain results, since the effect of relatedness cannot be easily determined until the three types of equity carve-outs are separated.

To isolate a stronger result for growth opportunities favouring a spin-off divestiture, further work may be required to identify a more suitable growth proxy than Tobin's Q, which is also affected by market forces. In a strong market, greater support for a carve-out should exist, reducing our observed effect. A measure of valuation with respect to the sector of the parent's industry, similar to the diversification discount (Berger & Ofek, 1999), might be attempted to capture a relative effect of growth opportunities. Then macro-economic indicators or the liquidity index of Schlingemann et al. (2002) might adequately reflect the positive or negative influence exerted by the external capital market for an effective separation of variables.

Finally, significant effects are found that relate to the relative size of the subsidiary. When the subsidiary is large compared to the parent firm, it is more likely that a minority carve-out will be undertaken, due either to constraint in the internal market or consideration of demand in the external market. Although two-stage divestitures are beyond the scope of the current study, the use of a minority carve-out as an intermediate step in such transactions has increased (Thompson and Apilado (2006), Vijh (1999)). These authors find that the relative size of subsidiaries has increased over time and Shleifer and Vishny's (1992) inverse relationship between size and liquidity is an important consideration in divestiture. Separation of the various effects corresponding to larger subsidiaries may show promise of improving the decision model presented here.

# Chapter 3

## The Truth about Income Trusts: Lower Volatility or Simply Less Tax?

### 3.0 Abstract

Income Trusts in Canada allow a unique view of publicly traded flow-through securities in an open market setting. In this empirical study, we find that the 240 income trusts listed in Canada exhibit lower historical return volatility than a matched sample of firms of similar size in similar industries. Of the two common income trust structures, those that pay distributions as a 'top-line' royalty expense display lower volatility than those that pay distributions as a combination of dividends and interest for the equity and subordinated debt holdings. Further, trusts that focus in specific industrial sectors such as real estate, resources, or utilities are less volatile than the more general, business classification. When the magnitudes of returns are considered, however, we find no evidence of higher performance in return with respect to risk for income trusts over the matched firms. With respect to thirteen Toronto Stock Exchange (TSX) sub-indexes, insignificant improvement in the efficient frontier for portfolio selection is evidenced in the monthly income trust return data from February 2004-2006. On October 31, 2006, the federal regulations on income trusts changed to reduce the tax advantage of these organizations after 2011, affecting the prices of these securities relative to their risks as reported here.

## 3.1 Introduction

In recent years, Income Trusts burst into the Canadian securities market, being the most frequent and largest public offerings available. Despite their popularity, this type of investment has suffered criticism as a viable security class due to both aggressive marketing and the restricted demographic of the purchasers, who are primarily retail investors. Income trusts are 'flow-through' structures resulting in distributions much greater than normal dividend payouts and payments are only taxed once, at investors' personal rates. Thus the securities have become popular with income dependent investors in lower tax brackets or those that can avail themselves of tax-shelters. If the distributions were considered stable then income trusts might provide a unique niche in the marketplace, but until now, there has been no assurance that these securities are less volatile than comparable investments. Herein, we quantitatively evaluate the stability of the currently listed income trusts in Canada to assess their relative risk in the period prior to both their inclusion in the TSX composite index and the ensuing legislative changes on October 31, 2006, that affected their tax status.

This paper adds to the empirical literature on income trusts in three aspects. Using a matched sample of companies that do not operate under the beneficial tax structure of trusts, volatilities are compared to indicate that trust units are lower risk securities. Secondly, the available income trust securities are separated along the dimensions of structure and broad industrial classification to assess relative risk in the chosen sub-classes. Finally, we test the relative magnitude of returns using several performance measures and demonstrate spanning of income trust returns by the existing TSX sub-

indices during the period of study. Throughout, the performances of trusts that focus in particular industry sectors are compared to the more general 'business' classification.

Income trusts are found to be less risky securities than comparable stocks in general and by choosing trusts in certain sectors, there is some ability to reduce return volatility, with the expectation of positive performance. This result supports the finding of Cleary and MacKinnon (2006), who studied a sample of 59 income trusts in the TSX Income Trust Index. These authors find that trusts complete the market and enhance the portfolio efficient frontier. The current study incorporates the remainder of the income trusts that are publicly traded during our period of study and establishes certain trusts as potential low-risk security investments in Canada.

The rest of the chapter is organized as follows. Section 3.2 describes the current literature relating to income trusts. Section 3.3 describes their situation in the Canadian market and introduces the dimensions of study. Methodology is covered in Section 3.4, which leads to the results discussed in Section 3.5. Section 3.6 concludes.

## 3.2 Related Research

General descriptions of income trusts and trust structures have been provided at investor conference proceedings, in the news media and in industrially sponsored reports (see Halpern and Norli (2004), Lee (2002), and Deloitte and Touche's Canadian REIT Guide (2002)). King (2003) has provided a deeper description of the trust industry and indicates some concern about the health of the market. More recently,

Wang (2006) provides a specific explanation of the business investment class of trusts by providing a thorough description of a single business trust, General Donlee Income Fund. However, a detailed document offering a comparison between the basic types of income trusts is not yet available.

Finance research on income trusts has covered the expected groundwork of examining the abnormal returns of income trusts with respect to the Canadian market. A majority of trusts are formed via initial public offerings (IPO's) and thus underpricing comparisons are also appropriate.[21] Jog and Wang (2004) complete an early study in this area in which the returns of income trusts are compared to the then TSX 300 stock index and the authors find abnormally low returns for the trusts but no underperformance. These authors admit that a more appropriate index may be chosen, and James (2005) extends their work to find less underpricing of income trust IPO's relative to the BMO Nesbitt Burns trust index when compared with studies on common stock IPO's. James suggests that risk reduction is a possible explanation for her result but does not explicitly measure the risk of trusts. While Australian tax regulations changed in 1987 to remove the advantages of flow-through investments, trusts were popular in that jurisdiction prior to the event. During that period, James, How, and Izan (1994) find results similar to the Canadian studies in the Australian market. Finally, Boabang (2005) studies a sample of income trust IPO's to relate longer run performance to significant factors chosen from the IPO process. Generally, income

[21] These studies can be considered relative to well-recognized strand of literature on IPO Performance included the descriptive summary of Ritter and Welch (2002).

trusts are considered to be fairly priced at the initial offering with respect to future returns.

The process of emerging as an income trust from the initial public offering has been described as value enhancing simply as a result of the change in organizational form. By studying the IPO process itself, Huson and Pazzaglia (2006a, 2006b) uncover two important aspects of reorganization as a trust. Considering only the income trusts involved in IPO's, the authors find evidence of improved valuation accompanying the transformation and uncover indicators of market timing that prove significant. From a descriptive standpoint, they find the trust unit offerings receive no discount for underwriter services, are older than the comparative corporate entities, and are less risky in general than other IPO's. These combined works aptly describe the recent reception of income trust offerings in the Canadian market, where the investment community has been keen on the tax and yield advantages of the flow-through structure.

Zetzsche (2005) builds on this description to posit that such strong market influences could lead to a pricing 'bubble' in the income trust sector. He highlights the aggressive marketing efforts associated with trust securities at a time when income recognition is a high priority for retail investors. King (2003) makes a less emphatic case but does criticize the trust market in an earlier period when institutional investors were underrepresented and effective monitoring by the market was therefore suspect. The potential for a 'bubble' in the market, however, is balanced against the fact that

fundamental valuation is straight forward, adhering to the principles of discounted cash flow. From this standpoint, Klasssen and Mescall (2005) develop a theoretical description from Dempsey's (2001) model and the authors complete their analysis by predicting the appropriate clientele for the income trust sector, those in lower tax brackets seeking yield. Thus these authors close the circle, as the current surge in trust popularity does accompany growth in the demographic of income-seeking retirees.

In the area of portfolio theory, Cleary and MacKinnon (2006) position income trusts in the Canadian security market, finding that trusts align more closely with equities than bonds based on correlation between the indices. Further, these authors indicate weak support for improvement in the efficient frontier of the TSX composite index when the sub-index of 59 larger income trusts is included. Whether there is a greater impact due to all existing income trusts, which now number more than two hundred in various types of businesses, is still to be determined.

### 3.3 Problem Definition

Income trusts were established to fulfill a need in Canada: to attract investment in relatively stable assets, primarily in the real estate and resource sectors of the economy. A comparable U.S. corporate form is the Master Limited Partnership, which is restricted to operation in either of these sectors. Without a similar restriction in Canada, income trusts have come to exist in most established sectors of the economy and there has been some recent concern that all firms might move to this organizational form.

There are four areas of support for the flow-through structure of income trusts, including tax avoidance. The most easily indicated benefit arises from the fact that any firm with a relatively stable stream of cash flows can avoid most taxation at the corporate level if the majority of cash flow is paid out as a recognized expense. This reduces net earnings towards zero. While the result is not unique to the corporations that convert to trusts, attaining a sufficient expense obligation is generally difficult in Canada without the trust organizational form. The investment trust provides a means to combine the issue of a subordinated high-yield note with common shares in an offering of trust units. In this way, interest expenses are passed directly to unit-holders who are taxed once at their marginal personal tax rate. A royalty trust provides a similar payout allocated to a royalty claim on assets. In either income trust form, the magnitude of these pre-tax cash flows far outweighs any comparable dividend policy. The marginal tax rate for the investor will also be higher, however, deriving from the requirement to claim the payout as a mixture of dividends, interest, and return of capital.[22] To understand the expected increase in the value of the distributions when compared to average dividend streams, we note that Fama and French (2001) find that U.S. firms paid out dividends at 43% of after-tax earnings over a twenty-five year period of study. Canadian firms may be expected to pay out in similar or lesser ratios. Based on this data, distributions are predicted to be as much as three and half times higher for a firm in a 40% corporate tax bracket choosing to pay out 90% of pre-tax profits. For an

[22] See Mintz and Richardson (2006) or Lamb (2006).

investor in a low marginal income tax bracket, these cash flows are much more valuable than a reduced dividend payment.

A second, related argument for the trust organization was described by Cleary and MacKinnon (2006) as the "bird in hand" scenario, where certain cash flows today are preferred to uncertain capital gains in the future. This advantage allows investors to quickly ascertain the fundamental value of the firm using the discounted cash flow technique. Expected distributions are well publicized for most trusts, and some have been essentially unchanging. Within minutes of the announcement of taxation reforms on the evening of October 31, 2006, the expected November 1st opening unit prices of most trusts could have been predicted to drop twenty percent below the previous day's close, which was the approximate observed result. Subsequently, a number of trusts have raised their distributions and have regained some of the lost market value in response. However, the calculation of the value of income trusts remains relatively straight forward. As long as distributions remain above the return required for the assessed risk of the underlying corporation, then income trusts should remain popular. Though unit prices will be lower when taxes are deducted, the required rate of return will also be lower as any uncertainty relating to future tax treatment has now been resolved.

In this respect, it is difficult to predict how the government will set the taxation of future distributions, since corporate taxation of the income trust itself denies that all revenues pass through and questions the legitimacy of the subordinated high yield note

offered by the underlying corporation. If the note is unacceptable to regulators, then the residual payment must be considered a dividend since it will be paid from taxed earnings. Therefore it should qualify for the dividend tax credit, reducing the personal tax paid on receipt. This would treat income trusts in a fair manner with respect to other corporations and offset the additional tax collected at the corporate level. In the process, however, the trust shell company would become a redundant layer of management, likely to dissolve. In fact, taxation of trusts will only make the securities less valuable in the market and the underlying corporations are more likely to become takeover targets in the years ahead.[23]

The third well referenced reason to adopt a trust structure stems from the reduction of agency costs in the corporation that arise through the conflict between the value maximizing behaviours of the managers and the investors, resulting in over-investment and undue rents (Jensen (1986), Jensen and Meckling (1978)). The discipline of the large regular distributions ensures that cash is not being invested in value-reducing strategies or perquisites by management. Recent corporate scandals have only made shareholders more skeptical of management and they now seek yield,[24] removing excess cash from the organization. In this way, the income trust structure and resulting debt financing is quite similar to a leveraged buy-out (LBO). Jensen (1989) argues that these corporate forms might eventually supplant the more typical public corporation, particularly in slow growth sectors of the economy. Rappaport (1990) counters that

[23] In fact, Fording Coal adopted a trust structure when it was originally spun off from the CP conglomerate to avoid the potential for a hostile takeover and Boone Pickens used the MLP structure to protect Mesa Oil in the similar manner in 1985.
[24] "The uneasy crown" *Economist Briefing Note on Private Equity* (Feb. 10, 2007) pp. 74-76.

private operations eventually require additional flexibility to face economic realities, and this makes an equity offering in a reverse LBO necessary. However, the income trust does allow the participation of retail investors in the buy-out and to date, subsequent unit offerings have been successful in providing additional funding as required. In an economy chasing yield into the foreseeable future, more mature companies operating as trusts will raise funds for acquisition rather than investment in real options for growth. Each time, the decision is assessed by the market as described by Easterbrook (1984). Thus Jensen's (1989) argument for leveraged buy-outs is unabated and it does seem to relate well to the Canadian market experience, where an increasing number of firms are moving towards trust reorganization. As noted above, the only impediment to their adoption is the proposed legislative change that will lower income trust distributions and thus their prices after January 1, 2011.

Agency cost reduction for income trusts also extends to the conflict between subordinated creditors and shareholders. In the trust structure the majority of debt, certainly all of the risky debt, is held by the unit-holder, who is also the shareholder. Therefore costs of monitoring by the subordinated creditors are avoided. Reduced distributions or announcements of reductions drop unit prices precipitously, indicating a fairly efficient reaction from the investment community.[25] Although income trusts are criticized for having relatively poor governance, the payout of the majority of cash flows seems to provide a reasonable substitute for governance controls, consistent with recent findings of John and Knyazeva (2006).

[25] "Bloom is off the rose in income trust sector", *The Globe and Mail* (October 13, 2006).

The final reason for the popularity of income trusts relates to liquidity and the ability of investors to afford the income trust units. The trust packages investment in high yield debt with an equity stake in the enterprise. The high yield debt is affordable since units generally begin trading at prices below twenty dollars. As a result, risky debt exposure has become more available to the average retail investor in Canada, which otherwise has a rather restricted high yield debt market. From the investor's point of view, diversification is relatively easy to accomplish and from an insurance standpoint, the issuance of the trust units allows the default risk of a given firm to be spread widely across the investment community. In this way, income trust units may potentially complete the market of Canadian securities.

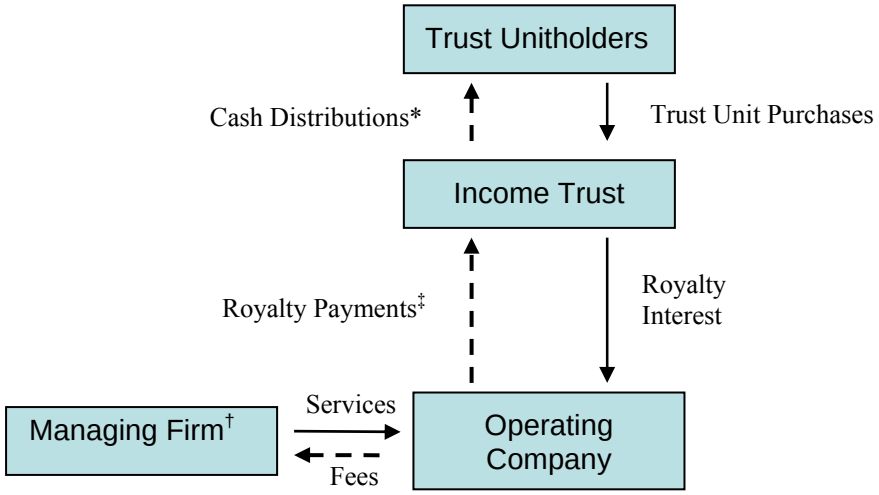
In the equity market, the demand for income-providing securities is growing. There exists a waiting clientele due to recent sentiment about uncertainty in the market and the demographic of the investing population. As the 'baby boom' moves into retirement, the demand for a steady income stream has increased and coincidently, scandals have taken the shine off several bell-weather stocks in the market.[26] Although the Sarbanes-Oxley accounting legislation increases the governance requirements for publicly traded corporations in the United States, we are now seeing a 'push-back' against these controls.[27] Certainty against further losses is thus reduced. Pension funds, acting as the tax-protected agents for the retiring population, also benefit from the higher pre-tax payouts afforded by the flow-through income trusts. Zetzsche (2005)

[26] Enron, Worldcom, and Nortel were found, in varying degrees, to be falsely reporting on their success.
[27] "Moving the Market: Why Spitzer is Backing Study that Endorses Less Regulation" *Wall Street Journal* January 23, 2007.

argues that such strong demand and aggressive marketing of trusts provides the potential for a pricing bubble. To guard against such a concern, it is important that the value of income trust units can be easily traced back to fundamentals, which relies on the stability of the returns. The first question investigated in this study addresses this concern. Are income trusts more or less volatile than a comparable group of firms trading as stocks? Using a matched sample of firms, we test risk directly by comparing the estimated return volatilities and correct for any inaccuracy due to volume turnover.

Second, we investigate the differences in types of trusts that have been organized. Due to an increased number of trust formations in recent years, these securities now occupy a number of distinct industrial sectors. Although popularity of income trusts has surged in the past four years, conventional trusts in the real estate and the resource sectors have existed for many years. Typically resource trusts adopt a royalty structure, as shown in Figure 3.1. These firms invest in proven, producing oil and gas reserves to ensure stable, 'top-line' distributions of cash for investors, albeit on a slowly depleting asset. The riskier, exploration side of the business is carried on by other players in the private or public market. Similarly, real estate investment trusts (REITs) invest in ownership and management of existing real estate properties at acceptable risk levels, while foregoing the uncertainties of the land development business. That trust landscape in Canada has changed.

**Figure 3.1: Basic Structure of a Royalty Trust**



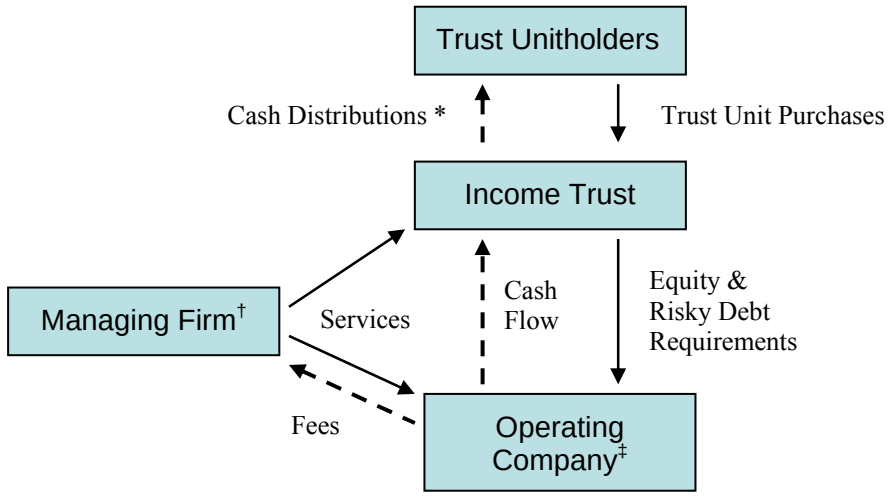

* Distributions are some combination of royalty payments and return of capital.
† Management may be externally contracted or internal to the operating company.
‡ Most commonly, royalty payments are derived from a resource property or a restaurant brand.

Recently, REITs have sharpened focus by investing in more specific property types such as hotels, apartments, and retirement homes. Oil and gas trusts can no longer be solely defined as royalty structures and some describe exploratory activity within their mandate in the annual report. In response to deregulation throughout the sector, utility trusts[28] have become an increasing presence in the market and all of these trusts adopt an investment structure, as shown in Figure 3.2. Business trusts make up the final industrial category but this is essentially a catch-all for operations ranging from food preparation to industrial transport. In the business category, there are energy services firms that contract primarily to the oil and gas sector and restaurants that have adopted the royalty structure to capture the value of their brands. Thus there is great diversity in

[28] This classification includes the 'power and pipeline' trusts but there are now a growing number of telecommunication players, particularly holding land-line assets.

the kinds of companies that now make up the total number of trusts in Canada and volatility may depend on the trust type. This concern is first investigated at the univariate level with respect to trust structure and trust industry classification.

**Figure 3.2: Basic Structure of an Investment Trust**




* Distributions are some combination of dividends from equity investment, interest from subordinated debentures, or return of capital.
† Management may be externally contracted or internal to the operating company.
‡ More recently underlying firms have also been structured as limited partnerships.

Then using a multiple linear regression, we investigate the relation between the return volatility ($\sigma$) and the types of trust, using four indicator variables along two dimensions. The structural dimension is picked up by the indicator variable ROYALTY, which is unity where a royalty structure is adopted and zero if the organization is an investment trust. REIT, UTILITY, and OG are variables used to indicate the classifications of the income trusts by industry sector as real estate investment trusts, utility trusts, and oil and gas trusts, respectively. In this study, OG is specific to firms involved primarily in

the production side of the oil and gas sector, corresponding closely to the original classification of resource trusts.[29] The trust type indicators are modeled in equation (3).

$$\sigma = \beta_0 + \beta_1 ROYALTY + \beta_2 REIT + \beta_3 UTILITY + \beta_4 OG + \varepsilon \quad (3)$$

where σ is the empirical estimate of historic volatility from Feb. 2004 to Feb. 2006,
ROYALTY indicates a royalty structure rather than an investment structure,
REIT indicates a real estate investment trust rather than a business trust,
UTILITY indicates a utility trust rather than a business trust,
OG indicates an oil and gas production trust rather than a business trust,
and ε is the error term.

Finally, the unit returns are included to position the performance of income trusts in the risk-return space. Due to non-normal distributions of returns, the income trusts are evaluated using the Sharpe ratio and two other adapted risk measures from the hedge fund literature (Johnson and Suo (2006)). Graphically, the four industry types seem to occupy distinct regions of expected return relative to risk. The royalty trusts also seem to outperform investment trusts. To test if the clustering of these securities leads to improved investment opportunities, the multivariate mean-variance spanning test introduced by Huberman and Kandel (1987) is employed. Using the same method, Cleary and MacKinnon (2006) find only weak evidence that the inclusion of trusts improves the frontier, but we find some indication that trusts that focus in particular industry sectors are situated in areas of positive performance with lower volatility on average. To assess the relationship, a multivariate analysis is set up to incorporate the structure and industry classifications, and income trust performance is tested with respect to the sub-indices of the TSX stock exchange. In this way, our comprehensive

[29] www.investcom.com includes the services firms in their classification of resource trusts and other authors have included other raw materials such as coal or iron ore in the resource classification.

study of risk associated with income trusts concludes by establishing whether these securities are necessary to complete the Canadian market.

### 3.4 Methodology

The data are collected solely from the Canadian market, as Canada is the only developed jurisdiction to allow the 'flow-through' income trust structure to be adopted across all sectors of the economy. A complete listing of Canadian income trusts can be found at www.investcom.com. From this list, only trusts with inception dates prior to January 1, 2006 are included in the study. Datastream is the source of market value, daily price and daily distribution information for this list of 240 income trust securities. The study is designed to assess whether the risk in the income trust sector is greater than that found in the common stock market, so the sample of trust unit securities is compared to a matched set of publicly traded stock securities.

The Advance 4.0 interface for Datastream is used to manually compile a list of matching firms for the sample of income trusts. The primary selection criteria are that firms be Canadian, traded on the TSX, of comparable size, and in the same sector of industry, preferably in the same business. If a matched firm cannot be found on the TSX, then firms on the New York Stock Exchange (NYSE) and American Stock Exchange are included. It is understood that the Canadian and U.S. markets performed differently in this period, but by restricting our selection to the larger U.S. exchanges, it is expected that the volatility of the matched sample will not be unduly biased towards higher volatility due to the 'size' effect. Sixty-six U.S based firms were included in the

final matched sample. The sector groupings provided by Datastream are used to facilitate matching where possible but in some cases, more appropriate matched firms are found manually in an alternate sector.[30] If an exact match is not available in a given sector, then a firm in a related industrial sector is chosen. Herein, size of the matched firm is included as an order of magnitude selection, controlled by restricting selection to the larger stock exchanges. Where possible, the matching firm is chosen to be at least as large as the corresponding income trust. As might be expected, matching of firms is most difficult for the oil and gas and the REIT sectors, where the income trust structure has become a well established organizational form. In the United States as well, these are the two industry types that are allowed to operate as flow-through organizations, in the form of master limited partnerships (MLPs) and REITs, respectively. Many larger players have already adopted the trust or partnership structure.

Our first test compares the relative risk of income trusts with a set of matched firms using components of variance techniques to construct suitable confidence intervals. The proxy for risk is estimated volatility from February 25, 2004 to February 24, 2006, calculated from two years of historical data as described in Hull (2003). The interval calculation is carried out using daily variances before these results are converted to volatility, defined herein as annualized standard deviation. For comparison purposes, intervals are first constructed using three parametric techniques based on the assumption that returns are independent and normally distributed: Satterthwaite's

[30] For example E.D. Smith Income Fund, a recognized producer of jams and preserves was not classified by Datastream as a food producer, whereas Smucker Jam, its matched firm, was.

procedure (1946), Welch's procedure (1956), and the modified large-sample procedure proposed by Graybill and Wang (1980). Then a non-parametric bootstrap percentile interval, as described in Efron and Tibshirani (1993), is constructed to provide robust estimates with respect to the distributional shape of returns and the possible effect of outliers in the data.[31] Finally, using the Kolmogorov-Smirnov criteria for 'goodness of fit', the distributions of the sample variances are compared to each other and then to theoretical Chi-squared ( $\chi^2$ ) distributions, which are appropriate when returns are assumed to be normally distributed.

The final concern in the first series of tests for the matched volatility estimates relates to the frequency of trading activity. The volume turnover of the trust units is compared to the observed turnover in the matched set of common stocks. In situations of non-trading, Lo and MacKinlay (1990) find volatility estimates for individual securities to be higher than the expected risk of the security, as shown in equation (4). In this expression, the expected return, $\mu_i$, is unaffected by the nonsynchronous trading and is estimated directly as the mean of the data series. The probability of non-trading ( $p_i$ ) is estimated as the actual probability observed during the sampling period. Since lower volume turnover in the matched sample of firms could result in an upward bias in volatility estimates, the return data and turnover data are reviewed to identify whether such a bias is likely. The matched firms display somewhat greater inconsistency in trading and therefore the volatility estimates are adjusted and compared.

[31] The separation of the intervals is further supported using a non-parametric test of medians, that rejects the null hypothesis that the volatilities of the income trusts could be drawn from the same population as the volatilities of the matched firms.

$$\text{var}\left[R_{it}^{o}\right] = \sigma_i^2 + \frac{2p_i}{(1-p_i)}\mu_i^2 \qquad (4)$$

where $R_{it}^{o}$ is the vector of observed time series returns subject to nonsynchronous trading,
$\sigma_i^2$ is the variance estimate with continuous trading,
$p_i$ is probability of non-trading,
and $\mu_i$ is the expected value of the daily return.

The second group of tests extends the analysis of the volatility data by separating the trust sample into sub-samples based on two criteria. First, we classify trusts in their industry sectors as utility trusts, REITs, oil and gas (production) trusts, and general business trusts. Then, royalty trusts are compared to investment trusts, with the latter group making up a much larger sub-sample. For univariate comparison identical statistical methods are used in this analysis as those described above in the matched sample study, but only the bootstrap intervals are presented since these provide the most appropriate estimates based on the non-normality of the data.[32] In order to quantify the conditional effects of the income trust sub-classifications along both dimensions a multiple regression, described in equation (1), is estimated. The error structure does not allow direct tests of significance for the volatility data, so coefficients are judged by their unbiased bootstrap confidence intervals, based on five hundred repetitions of the regression estimation, sampling with replacement.

The final contribution of the study extends the work of Cleary and MacKinnon (2006) by providing a placement of the different income trust types in the portfolio selection

[32] The assumption of normality provides theoretical limits that are much narrower with far less weight in the tails of the distribution than that actually observed.

space. This section first relates the reduced risk of trusts to the expected average annual returns by comparing three performance measures: 1) the Sharpe ratio, 2) the Sortino measure, and 3) the Omega ratio. The Sharpe ratios are calculated using equation (5) for both the income trust sample and the matched set of firms. A graphical comparison of distributions is presented with supporting statistical tests. As above, robust bootstrap interval estimation is used to overcome the non-normal nature of the observed distributions when testing the location measures and Kolmogorov-Smirnov 'goodness of fit' tests allow comparison of the similarities of distributions themselves.

$$SharpeRatio = \frac{E(R_i) - r_f}{\sigma_i} \tag{5}$$

where $E(R_i)$ is the expected annual return of security i,
$r_f$ is the risk-free rate of return,
and $\sigma_i$ is the estimated volatility of security i.

The Sortino measure, introduced by Sortino and Price (1994) to account for non-normal returns, is included as equation (6). This measure reconciles the interpretation of risk as a down-side variation from an acceptable rate of return, generally associated with a targeted expected return. The numerator is the expected value of returns above the chosen rate of return and the denominator is a downside standard deviation, deriving only from values less than the acceptable rate. The generalized Sortino measure sets the acceptable return to the return of a market index. In this study, use of the three-month treasury bill rate, a secure ten-year bond yield chosen at four percent, and the return on the TSX composite index all produce comparable results. As income trusts are often chosen as long term investments that generally pay steady distributions, the

expected return for reporting purposes is set at the of four percent level, which was a competitive level of return for a secure long term bond during our period of study.

$$Sortino = \frac{\sum_{it} (R_{it} - r)^{+}}{\sqrt{\sum_{it} ((R_{it} - r)^{-})^{2}}} \tag{6}$$

where $R_{it}$ is the daily return of security i in time period t = (1,..T),
r is the expected/acceptable rate of return,
$(R_{it} - r)^{+}$ are positive returns, those above the target rate r,
and $(R_{it} - r)^{-}$ are negative returns, those below the target rate r

The Omega measure of Keating and Shadwick (2002) relates the upside potential of an investment to the downside, relative to an acceptable rate of return. This ratio is calculated as described in equation (7), where the numerator is the sum of all returns above the chosen expected rate and the denominator is the sum of those returns below that rate. Without affecting the interpretation for comparison purposes the absolute value of the ratio is presented. As above, a long term bond is deemed an appropriate comparator for investors interested in a steady yield, so reported results use a rate of return, r, set equal to four percent.

$$\Omega(r) = \left| \frac{\sum_{it} (R_{it} - r)^{+}}{\sum_{it} (R_{it} - r)^{-}} \right| \tag{7}$$

where $R_{it}$ is the daily return of security i in time period t = (1,..T),
r is the expected/acceptable rate of return,
$(R_{it} - r)^{+}$ are positive returns, those above the target rate r,
and $(R_{it} - r)^{-}$ are negative returns, those below the target rate r

To demonstrate the portfolio performance of income trusts relative to the Canadian market empirically, a portfolio spanning test is performed. The sample of income trusts is again separated into sub-samples based on two criteria. Trusts are classified in their industry sectors as business trusts, utility trusts, REITs, and oil and gas (production) trusts. Royalty trusts are then compared to investment trusts. Results indicate diagrammatically that the subgroups tend to cluster in different areas of the risk-return space. Similar to Cleary and MacKinnon (2006), spanning tests developed by Huberman and Kandel (1987) are performed to compare equally weighted portfolios of income trust sub-classifications with the TSX sub-indices. During the period covered by this study no income trusts are included in the TSX composite sub-indices.

The method assumes that the multivariate linear model in equation (8) can be used to relate the matrix of returns of N portfolios, $\mathbf{r_N}$, to the returns of k spanning portfolios, $\mathbf{R_k}$. If complete spanning is the case, then the vector of intercepts will be a zero vector, $\boldsymbol{\alpha} = \underline{0}$, and the vector of the sums of the coefficients from each equation should be the identity vector, $\boldsymbol{\Sigma B} = \underline{1}$, where each vector has N elements. The constrained system of equations can be solved for the two criteria in an iterative fashion or through use of Zellner's seemingly unrelated regression model (Gibbons (1982)). Significance of the overall result is then tested using an F-test constructed to compare the residual variation of the model where the spanning hypothesis does not hold to the case where the market in k securities is complete, the constrained model. The test results reported here are based on construction of equally-weighted portfolios of the income trust securities and

no risk-free asset is considered in adjustment of the unit returns or to adjust the degrees of freedom in the spanning test.

$$\mathbf{r}_N = \boldsymbol{\alpha} + \mathbf{B}\mathbf{R}_k + \boldsymbol{\varepsilon} \tag{8}$$

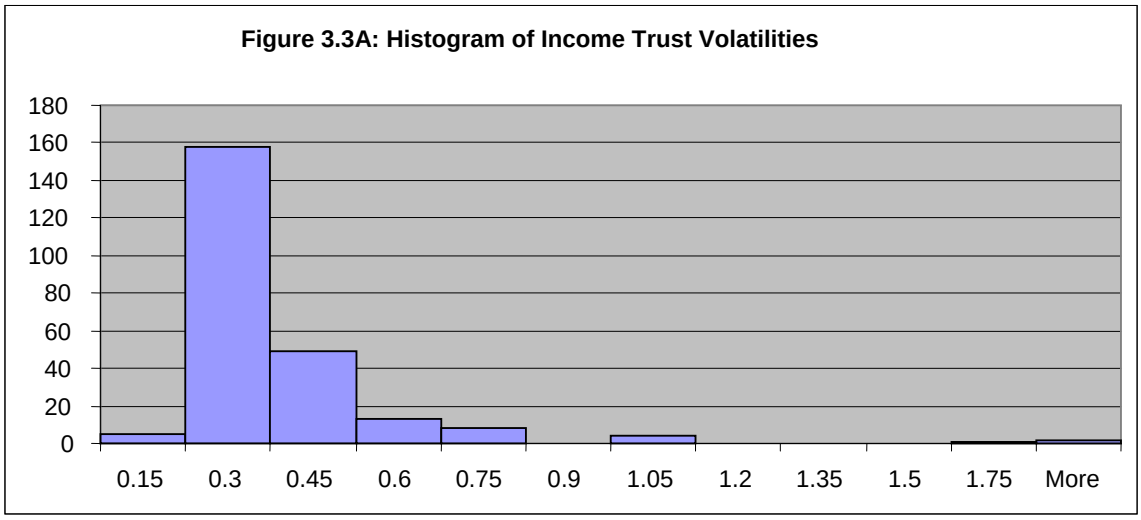
where $\mathbf{r_N}$ is the matrix of time series returns across the four industrial classifications or two trust structures,
$\boldsymbol{\alpha}$ is the k-vector of intercepts,
$\mathbf{B}$ is the kxN matrix of regression coefficients,
$\mathbf{R_k}$ is the matrix of time series returns for the thirteen TSX sub-indices
and $\boldsymbol{\varepsilon}$ is the N-vector of error terms.

The current study differs from the work of Cleary and MacKinnon (2006) as we expand the dimension of the response portfolios in the spanning tests to a multivariate setting that separates the income trusts by classification into industrial sectors or into the two common income trust structures. Data for the thirteen TSX sub-indices are collected from Datastream to cover the same period of study and analysis at daily, weekly, and monthly frequencies has been completed. Since results are comparable at each duration, only the monthly results are presented here for brevity.

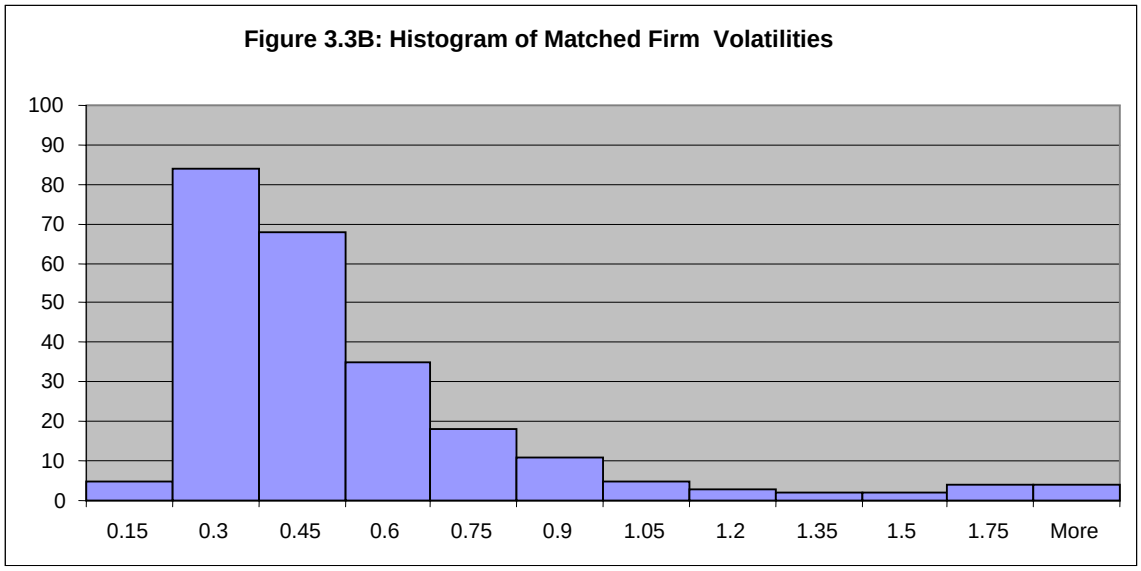
## 3.5 Discussion of Results

Estimated volatilities for income trusts are lower than those calculated for the matched firms, as presented in the graphical analysis shown in Figure 3.3. The average volatility for the sample of trusts is 31.83%, which is significantly lower than the matched sample of traded firms, whose average is 46.83%. Both histograms indicate characteristic right-skewed distributions associated with variance measures, which

**Figure 3.3: Comparison of Distributions of Investment Volatilities**




| 99% Confidence Intervals | Income Trusts | Matched Firms |
|---|---|---|
| Satterthwaite | {0.3823 , 0.3965} | {0.5864 , 0.6015} |
| Welch with adjustment | {0.3826 , 0.3969} | {0.5865 , 0.6016} |
| Graybill & Wang | {0.3830 , 0.3976} | {0.5871 , 0.6029} |
| Bootstrap Interval | {0.3145 , 0.4813} | {0.5042 , 0.7094} |




should theoretically follow Chi-squared ($\chi^2$) distributions under the assumption of normality. Confidence intervals (99%) are calculated using three parametric procedures (Satterthwaite (1946), Welch (1956), and Graybill and Wang (1980)) and the robust nonparametric bootstrap technique (Efron and Tibshirani (1993)). The

results are included in Figure 3.3 to illustrate the limits of the statistical significance for the frequency distributions displayed.[33] The bias-corrected bootstrap intervals are noticeably wider than the three intervals derived from distribution theory but all intervals indicate a separation between the income trust and matched firm results. From the histograms of Figure 3.2 and the confidence interval analysis, we can see that income trusts do exhibit lower volatilities than the matched firms.

Kolmogorov-Smirnov tests are applied to compare the observed distribution of income trust volatilities to that of the matched sample and then Chi-squared "goodness-of-fit" tests are used to compare each of the samples with the theoretical $\chi^2$ distribution. The tests indicate that the volatilities of the income trusts and the matched sample can be reasonably assumed to be drawn from the same underlying distribution, though each has a different measure of location.[34] However, neither of these samples is $\chi^2$ - distributed since there are too many observations located in the upper tail. Thus, the battery of "goodness-of -fit" tests confirms the observed results from nonparametric interval estimation. Income trusts exhibit significantly lower volatilities than a size and industry matched sample of corporations, but volatilities do not arise from an underlying log-normal distribution of returns in either case.

The income trusts and the matched sample differ in the daily turnover trading volume recorded by Datastream. Most income trusts are regularly traded from their date of

[33] As the volatilities are not additive, these procedures define limits on the original variances, which are then corrected to volatilities. As such, the confidence intervals calculated by the variance component methods do lie above the mean volatilities quoted above.
[34] Tests of medians reconfirmed the result found above using confidence intervals.

inception, which is more frequent activity than that evidenced in the matched sample. In both samples, the REIT or real estate firms exhibit periods of extended non-trading. Both of these effects indicate that a correction for nonsynchronous trading may be required. However, the correction calculation shown in equation (4) includes both the expected value of the daily return and the probability of non-trading, and Lo and MacKinlay (1990) do state that the expected daily return is often small enough to negate any detectable effect. In fact, this is the result found with the sample of matched firms. Though the probability of non-trading is often measurable, the daily returns are very small and the calculated correction has not changed the distribution of volatilities from that previously presented in Figure 3.3. Thus our analysis is robust to the non-trading correction.

To determine if certain types of income trusts are contributing to the reduced risk that is observed, the sample of trusts is divided between the four recognized classifications of income trusts: REITs, oil and gas, utility, and business trusts. The mean volatilities indicate that utility trusts are the least volatile followed by oil and gas, REITs, and business trusts, in that order. However, the 95% bootstrap confidence interval for the REITs overlaps the adjacent intervals to such an extent that the respective volatility estimates cannot be statistically separated. This result is included in Figure 3.4A. This robust test of significance demonstrates that there is not sufficient evidence to conclude that the mean volatilities are significantly different for the recognized income trust industry classes. The increase in the number of business trusts in recent years does seem to lead to a sample with higher volatility, but the variance in the return

performance of REITs, one of the original classifications, does not allow us to draw such a conclusion statistically. Later analysis of unit return performance measures further confirms this finding.

**Figure 3.4: Bias-Corrected Bootstrap 95% Confidence Intervals**


**Figure 3.4A: Trust Classification Bootstrap Intervals (95%) for Volatility**

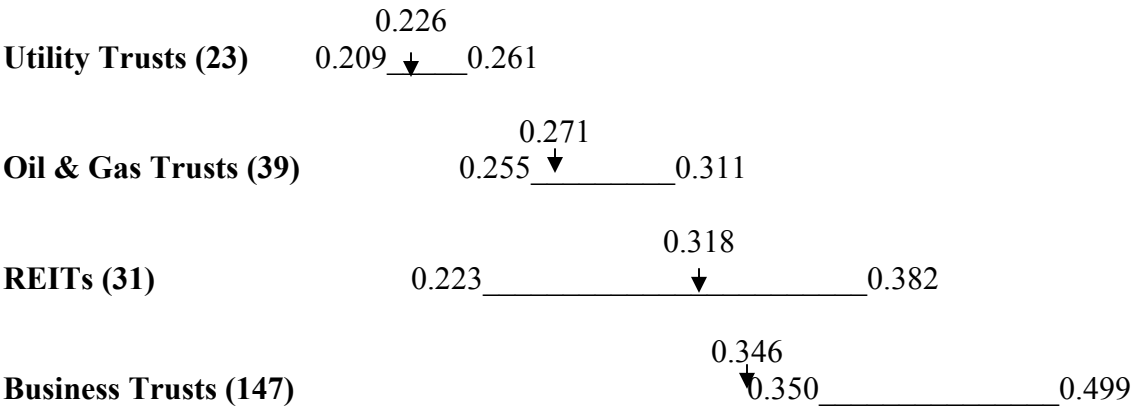
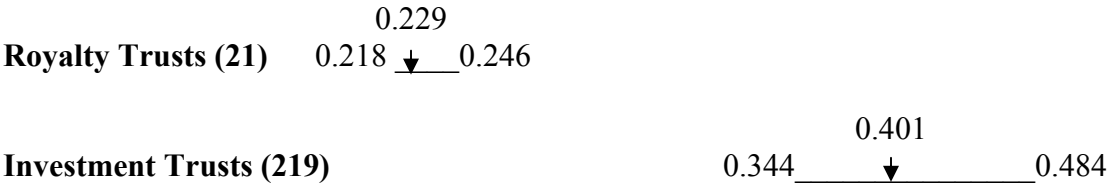



**Figure 3.4B: Trust Structure Bootstrap Intervals (95%) for Volatility**




To determine if one of the structural types of income trusts contributes more to reduced risk than the other, the sample of trusts is divided between the two recognized

structures: royalty trusts and investment trusts. The mean volatility of royalty trusts is lower than the mean volatility of investment trusts. The 95% bootstrap confidence intervals are included in Figure 3.4B and this test of significance demonstrates that there is sufficient evidence to conclude that the mean volatilities are significantly different for the trust structures. There is less volatility associated with royalty trusts.

Using regression analysis, the combined effects of the royalty structure and the accepted industrial classification types are found in relation to the business investment trust. The result for equation (3) is included in Table 3.1 as Model I, where 4.7% of the variation in the volatility measure is explained by the four indicator variables. Two of the indicator variables, ROYALTY and UTILITY are found to be significant in t-tests of the coefficients and the F-test indicates that the overall model also has acceptable significance. Comparing this result to the univariate work, oil and gas trusts now show less effect on volatility when the royalty indicator has also been included. This is a first indication that the newer oil and gas trusts are more risky as the more recent entrants are less likely to adopt the conventional royalty structure and may also be involved in exploration in addition to production from reserves. In the regression model, utility trusts prove to be low risk investments, but REITs and oil and gas trusts cannot be statistically separated from the business trusts.

## Table 3.1: Regression Results for Response = Volatility

The sample includes 240 income trusts traded on the Toronto Stock Exchange over the period from February 25, 2004 to February 24, 2006. The results are from an ordinary least squares (OLS) regression where the dependent variable is the historical volatility of returns and the independent variables are all indicator variables of income trust type. The first three classify the trust in its broad industry sector as follows: Utility is unity for a utility trust, REIT is unity for a real estate investment trust, and Oil & Gas is unity for an oil and gas production trust. Where these indicators all take the value zero, the trust is in the more general business trust classification. The final variable Royalty takes the value unity if distributions are royalty payments and it takes the value zero when distributions are returns on equity and debt investments. Return data are collected from Datastream.

| **Variable** | **(I) Trust Classes & Structure** | **95% Boot-strap Intervals†** |
|---|---|---|
| Utility | -0.127** (-2.56) | [-0.1722 , -0.0850]** |
| REIT | -0.032 (-0.72) | [-0.1267 , 0.1556] |
| Oil & Gas | -0.061 (-1.52) | [-0.1000 , -0.0164]** |
| Royalty | -0.102* (-1.92) | [-0.1425 , -0.0692]** |
| Constant | 0.353*** (18.91) | |
| F statistic | 2.91 | |
| (p-value) | (0.0224) | |
| $R^2$ | 0.0472 | |
| Adjusted $R^2$ | 0.0309 | |

The values presented in the table are coefficient estimates and t-scores in brackets, below. Significance is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating the 1% level.

† Bootstrap Intervals are based on 500 repeated measures of the regression equation and these are bias-corrected 95% percentile intervals.

Royalty trusts are represented in both the oil and gas, and business sectors, and the significant negative coefficient indicates that distributions from 'top-line' royalty payments generally lead to more certainty in an income trust's performance. For

royalty trusts in the business sector, most often in the restaurant sub-sector, this reduction in volatility may result from the noted annual rebalancing of the operations underlying the royalty pool of investments. Distributions are not paid from profits at all existing locations, providing flexibility for the trust to stabilize cash flow. Each year, less successful restaurants are removed from the pool and new locations are added, which can provide steady distributions sheltered due to asset selection and geographic diversification.

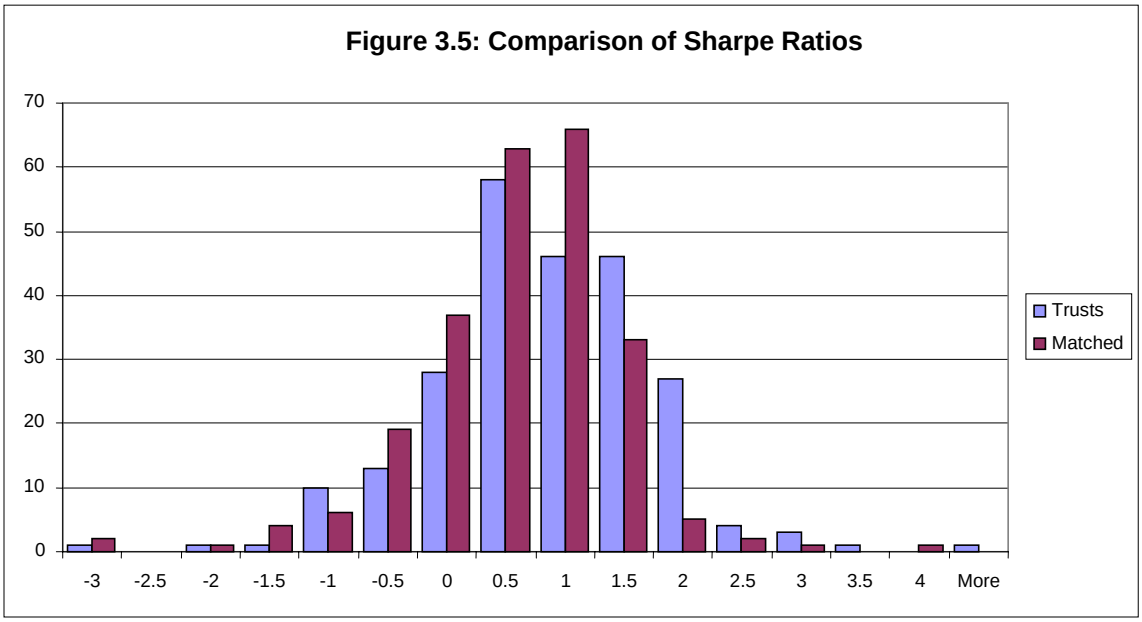
Although equation (3) has provided two important results, the estimation suffers from the problem of heteroskedasticity in the residuals. From residual plots not included here, we do find changing variance over the prediction region with increased uncertainty in predicted results for REITs and business trusts, when compared to the other two classifications. Statistically, the estimated significance of the reported coefficients becomes unreliable. To overcome the problem, bootstrap intervals of the coefficient estimates are presented in the second column of Table 3.1 to replace the t-statistics presented as significance tests in the first column. The interval estimates are based on five hundred repetitions of the regression equation and indicate that the UTILITY, ROYALTY and OG coefficients are significantly non-zero at the 95% confidence level using the robust bootstrap technique. Only the REIT confidence interval includes zero, indicating an insignificant estimate. The outcome here is quite similar to interval analysis presented in Figure 3.4A and supports evidence from the residuals. The error structure is masking the true effects and reducing our ability to test the significance of the coefficient estimates. A more focused effort on improving the

heteroskedastic error structure is beyond the scope of this paper but it is included in a later chapter of this work.

Histograms of the performance measures are presented to illustrate comparisons between the income trusts and the matched set of firms. In Figure 3.5, the Sharpe ratios for income trusts and the matched set of firms clearly align on top of one another but the income trusts demonstrate a strong negative skew that drives the average of this measure higher. The average Sharpe ratio for the income trusts is 0.4698 (median = 0.5547) and the average for the matched firms is 0.3230 (median = 0.3405). This result, when combined by the lower volatility findings, demonstrates that trusts occupy a space of lower returns combined with less risk, matching the needs of a certain target clientele. The moderate returns found in this sample are superior to investment grade bonds but are lower than those associated with higher risk equities. Cleary and MacKinnon (2006) use a smaller sample of income trusts that were eventually incorporated in the TSX composite index, and their results provide greater ratios for the income trusts. Similar ratios with lower variance are indicated here. As the authors suggest, this may result from the higher weighting of energy trusts in their sample, the effect of high energy prices on return performance, and the different time period covered in their study. We did find that Sharpe ratios for the oil and gas sector are almost three times greater than the average level (oil and gas mean = 1.250), and performance drops off for REITs (mean = 0.687), utility trusts (mean = 0.382), and business trusts (mean = 0.231), in that order. To compare this data with the volatility results above, this demonstrates that oil and gas returns are higher than average, utility

returns are lower than average and REITs demonstrate improved performance over the general business trusts. To account for the non-normal nature of the results, the analysis has been extended to include two additional performance measures commonly used in the hedge fund literature (Johnson and Suo (2006)).

**Figure 3.5: Comparison of Sharpe Ratios**

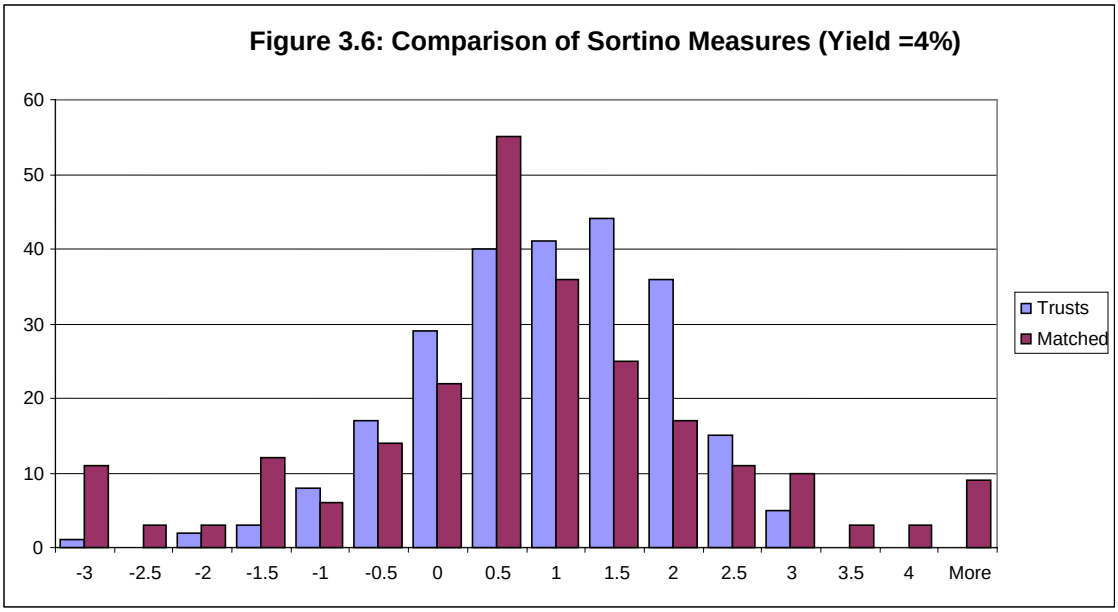



The Sortino measure, introduced by Sortino and Price (1994), compares the expected return relative to a chosen rate of return to the downside measure of risk below that chosen cut-off rate, as shown in equation (6) above. Since the investment in an income trust may be compared to an alternative longer term yield producing investment, the chosen rate presented in this study is four percent, a relatively competitive long-term bond rate during the period of study.[35] The average Sortino measure is 0.6484 (median = 0.6716) for the income trusts, which seems markedly higher than the average of -

[35] The risk-free rate of return during the period was 2.55% for the three month Canadian Treasury bill, with the six month bill marginally higher. Using either of these rates only reflects poorer performance for the matched sample of firms.

0.0486 (median = 0.4623) for the matched firms. However, the variance in this measure for the matched firms is much greater. As indicated in Figure 3.6, these data overlap to a great extent, similar to the Sharpe ratio results. This reflects a greater risk for those firms not structured as income trusts but the return profiles are comparable.

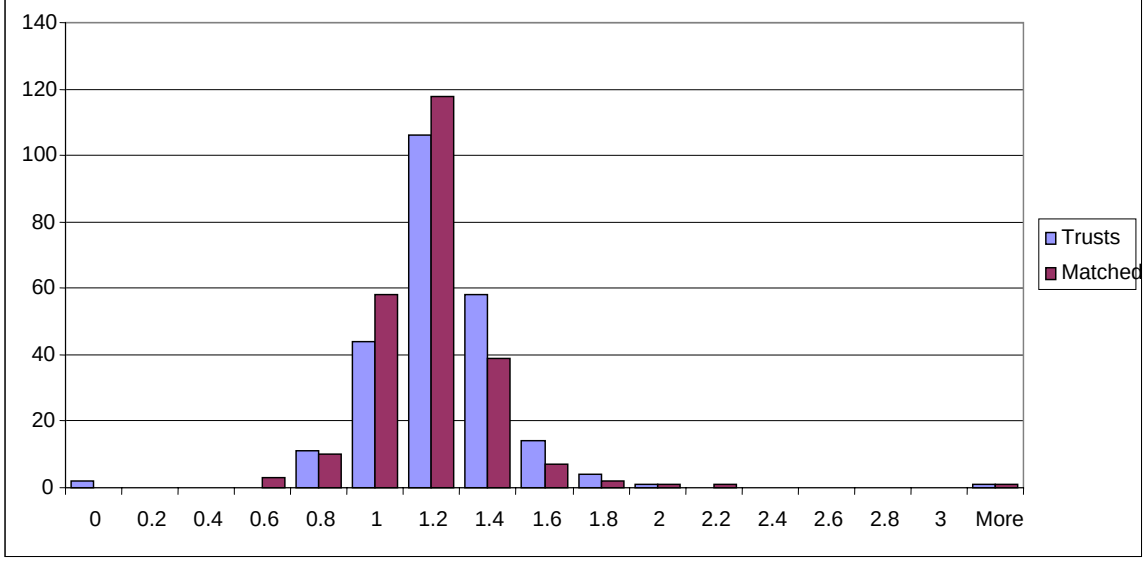
**Figure 3.6: Comparison of Sortino Measures (Yield =4%)**




Our third measure, the omega ratio sets the sum of the upside returns relative to a chosen cut-off return over the sum of the downside returns from the same value, as shown in equation (7). The chosen acceptable rate of return is maintained at four percent and a similar result is found. Trusts demonstrate an average ratio of 1.128 (median = 1.1101), outperforming the matched sample, whose average is 1.089 (median = 1.0706). From Figure 3.7, the overlap in performance is clearly demonstrated and two different distributions are also evident, which is similar to the Sharpe ratio results.

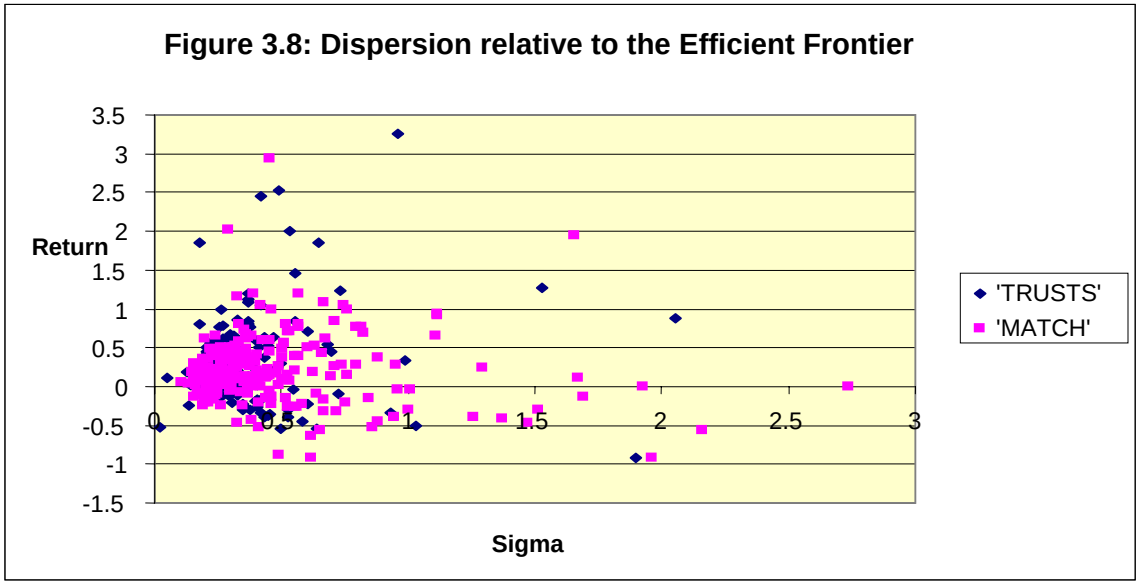
Thus two measures suitable for non-normal performance agree with the established mean-variance standard for portfolio evaluation.

**Figure 3.7: Comparison of Omega Measures (Yield =4%)**



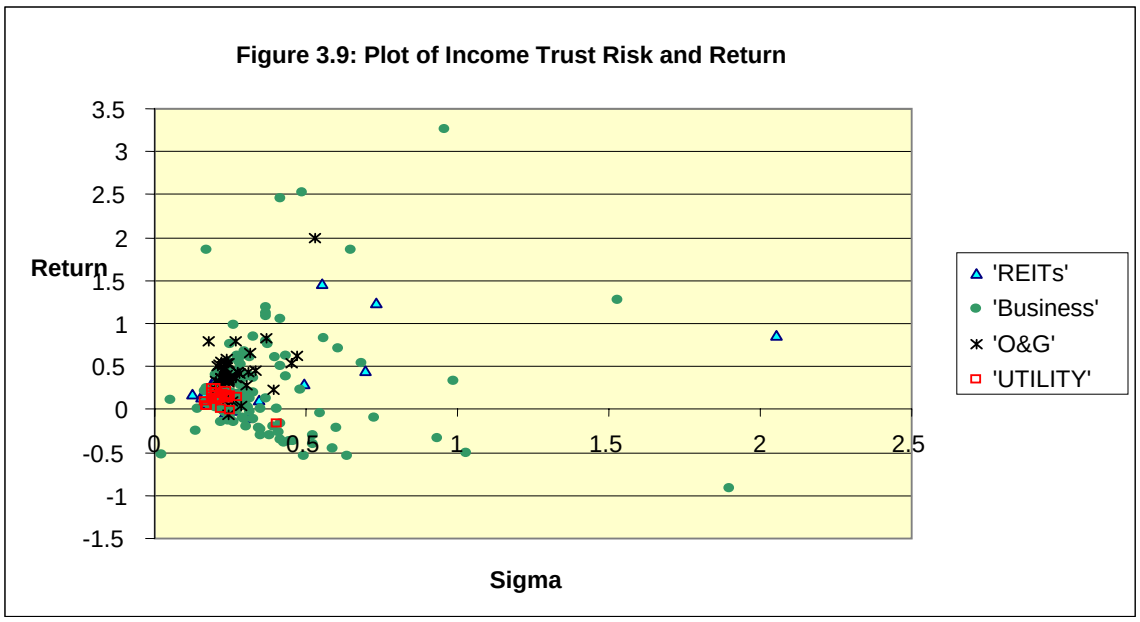

To formalize analysis, Kolmogorov-Smirnov tests are conducted for each performance measure and the depicted shapes of the income trust distributions and the matched firm distributions are found to be different. In the case of the Sharpe ratio, these distributions are not similar at a significance level less than one percent (calculated p = .001). For the Sortino measure, the distributions are found to be different at a critical probability close to eight percent (p = .078). The omega ratio distributions differ at one percent significance (p = .009). To test whether these performance results are different enough to result in a significant separation between the sample of trusts and the matched firms, bias-corrected percentile bootstrap intervals are calculated for the pairs of performance measures. In each case, there is no separation in the intervals at normal

confidence levels to indicate that the distributions have different measures of location. Thus although the income trusts demonstrate out-performance on average for each measure, in no case is this improvement significant statistically. The differing shapes of the distributions indicate that income trusts are unique and more secure investments, which corresponds to the remainder of the volatility study. However, the returns are no greater relative to the risk of the investment.




Similar to Cleary and MacKinnon (2006), we find a substantial overlap in the risk-return space of income trusts and the space occupied by the matched equities. Graphically, the data demonstrate that the trusts are clustered in the low volatility region as shown in Figure 3.8. When the trusts are separated into their industrial sector sub-samples, there is further clustering in the focused sectors, as illustrated in Figure 3.9. The utility sector offers mainly positive expected returns at low risk and the oil and gas sector provides greater positive returns at slightly higher risk levels. The

positive result associated with oil and gas is at least partly attributable to the world pricing of these energy commodities, which are at historically high price levels. The performance of REITs is much more variable. Though the majority of the return data are positive in this sector, the risk levels are not inconsequential. Business trusts offer less certainty than the more focused types and several have negative expected returns over the period of study. Members from this group, however, seem to extend the frontier beyond that defined by the matched set of firms.




We complete our analysis by testing whether income trust securities significantly improve the efficient frontier for portfolio selection. Empirical tests of spanning are carried out using the technique described by Huberman and Kandel (1987), evaluating equally-weighted portfolios of income trusts relative to the thirteen TSX sector sub-indices, including gold. The unconstrained regression results reflecting a potential

enhancement of the efficient frontier are included in Table 3.2, Panels A and B. The multivariate regressions result in several significant intercept estimates which correspond to positive expected returns for the 'zero-beta' portfolio in our tests. Also the TSX sub-index coefficients sum to values far from unity, which indicates some difficulty in spanning by the sub-indices. To test the overall model, however, the null hypothesis corresponding to a constrained system of equations must be solved using either an iterative method or Zellner's (1962) technique, as described by Gibbons (1982). When the constrained and unconstrained residual matrices are compared, no system of equations results in a significant F statistic that would indicate a marked improvement of the efficient frontier as a result of the inclusion of income trusts. Similarly to Cleary and MacKinnon (2006), we must conclude that the equally-weighted portfolios of all four industry types, the three focused industry classes, and the two structural types are all effectively spanned by the thirteen TSX sub-indices. That is, the income trusts do not provide a unique opportunity for investment beyond that available through a suitably chosen portfolio of the TSX sub-indices, which do not include income trusts.

The business classification of income trusts is most easily fit by a combination of the sub-indices (R-square = 91%), resulting in an insignificant intercept coefficient. From a policy perspective, it is difficult to assess what positive effect is being provided by shielding these organizations from additional taxation using the income trust structure. There is a slight reduction of volatility, but this group remains the most volatile among trusts. The observed return is no greater than could be expected from a conventional

## Table 3.2: Variance Spanning Tests using TSX Sub-Indices

240 income trusts traded on the Toronto Stock Exchange (TSX) over the period from February 25, 2004 to February 24, 2006 are grouped into equal weighted portfolios and tested for spanning using the method of Huberman and Kandel (1987). The results of an ordinary least squares (OLS) regression fit the returns of the trust portfolios against the returns of the 13 TSX sub-indices including gold. Spanning is indicated in these results if the coefficient estimates sum to unity and the intercept/constant is insignificant. Otherwise, there is some evidence in improvement in the efficient frontier. Panel A tests the four broad industry classifications, while Panel B tests the two trust structures.

### Panel A: Industrial Classifications of Income Trusts

| Variable | (II) Business Trusts | (III) Oil & Gas Trusts | (IV) REITs | (V) Utility Trusts |
|---|---|---|---|---|
| Energy | 0.0518 | **0.4154*** | -0.0556 | -0.0596 |
| | (0.56) | (2.06) | (-0.30) | (-0.35) |
| Financial | 0.2837 | 0.1793 | 0.0944 | 0.3745 |
| | (1.46) | (0.42) | (0.24) | (1.05) |
| Gold | 0.0310 | -0.4269 | -0.2978 | -0.2516 |
| | (0.20) | (-1.28) | (-0.95) | (-0.90) |
| Information Technology | -0.1069 | -0.0199 | 0.2513 | 0.1567 |
| | (-1.36) | (-0.12) | (1.56) | (1.08) |
| Consumer Discretionary | 0.1836 | -0.9877 | -1.1700 | -1.0836 |
| | (0.53) | (-1.30) | (-1.64) | (-1.70) |
| Consumer Staples | **0.8943***** | -0.0621 | -0.2922 | 0.2137 |
| | (4.02) | (-0.13) | (-0.64) | (0.52) |
| Healthcare | **-0.3317**** | 0.2435 | 0.0848 | -0.0572 |
| | (-2.67) | (0.89) | (0.33) | (-0.25) |
| Industrials | **0.4719**** | -0.0863 | 0.3314 | 0.3959 |
| | (2.30) | (-0.19) | (0.79) | (1.05) |
| Materials | **0.6852*** | 0.7282 | 0.8965 | **1.1708*** |
| | (2.17) | (1.05) | (1.38) | (2.02) |
| Metal/Mining | **-0.4340**** | -0.0309 | -0.3084 | **-0.5610*** |
| | (-2.76) | (-0.09) | (-0.96) | (-1.94) |
| Real Estate | -0.1704 | 0.1658 | **0.9117**** | **0.6142*** |
| | (-0.92) | (0.41) | (2.40) | (1.81) |
| Telecom | -0.0388 | -0.0963 | -0.0808 | -0.0573 |
| | (-0.29) | (-0.33) | (-0.29) | (-0.23) |
| Utilities | 0.1552 | 0.4516 | 0.3429 | 0.1905 |
| | (1.06) | (1.41) | (1.15) | (0.71) |
| Sum of Coefficients | 1.675 | 0.474 | 0.708 | 1.046 |
| Constant α | -0.00015 | **0.0246*** | **0.0188*** | 0.0112 |
| | (-0.03) | (2.21) | (1.81) | (1.20) |
| F-Statistic | **8.009** | 2.029 | 1.616 | 1.801 |
| Prob > F | **0.0012** | 0.1336 | 0.2260 | 0.1779 |
| R-Squared | 91.24% | 72.51% | 67.76% | 70.08% |

**Panel B: Organizational Structures of Income Trusts**

| Variable | (VI) Investment Trusts | (VII) Royalty Trusts |
|---|---|---|
| Energy | 0.0439<br>(0.36) | 0.1661<br>(0.74) |
| Financial | 0.1593<br>(0.62) | 0.2329<br>(0.49) |
| Gold | -0.2938<br>(-1.45) | -0.5285<br>(-1.42) |
| Information Technology | 0.0975<br>(0.93) | 0.0289<br>(0.15) |
| Consumer Discretionary | **-0.9419*** <br>(-2.04) | -1.0509<br>(-1.24) |
| Consumer Staples | 0.1115<br>(0.38) | 0.0448<br>(0.08) |
| Healthcare | 0.0048<br>(0.03) | 0.0745<br>(0.25) |
| Industrials | 0.3440<br>(1.26) | 0.2107<br>(0.42) |
| Materials | **0.9661**** <br>(2.30) | 1.2694<br>(1.64) |
| Metal/Mining | -0.37725<br>(-1.78) | -0.3387<br>(-0.88) |
| Real Estate | 0.5083<br>(2.07) | 0.2418<br>(0.53) |
| Telecom | -0.0208<br>(-0.12) | -0.2435<br>(-0.74) |
| Utilities | 0.2179<br>(1.12) | 0.4282<br>(1.20) |
| Sum of Coefficients | 0.824 | 0.536 |
| Constant α | **0.0172**** <br>(2.55) | **0.0229*** <br>(1.84) |
| F-Statistic | **2.353** | 0.999 |
| Prob > F | **0.0906** | 0.5110 |
| R-Squared | 75.36% | 56.50% |

The values presented in the table are coefficient estimates and t-scores in brackets, below. Significance is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating the 1% level.

corporate form when the risk of the investment is considered. Klassen and MacDonald (2005), who include business trusts in their analysis, also find that the firms that chose to convert into income trusts are no less volatile than comparable firms prior to conversion. The net effect of reorganization may be this slight drop in volatility. Cash distributions being bolstered by the risk-free process of tax avoidance at the corporate level are no greater than would be expected if the corporation operated without the requirement of paying out substantially all of its operating profits. This poor performance supports the assertions of Halpern and Norli (2004) and Mintz and Richardson (2006) that less suitable corporations seem to be migrating towards this organizational form simply to reduce their taxes.

When business trusts are removed from the multivariate spanning tests, the constrained system with three response variables provides an identical result: the F statistic of 0.502 is insignificant. Results for the three industry specific classifications do not provide evidence that the efficient frontier has been improved. The unconstrained results are the ordinary least squares estimates provided as models III, IV, and V in Panel A of Table 3.2. The oil and gas intercept ($\alpha$) is significantly different from zero at a level of ten percent but this may relate to a premium corresponding to higher energy prices over the period of study. The large percentage of firms in this sector that operate as income trusts separates this benefit from returns otherwise available through the TSX indices. Real estate has also been a reasonably strong investment lately and the REIT data indicate a similar but lesser effect in the value of the intercept. Though the TSX sub-index coefficients seldom sum to unity in this model and many of the individual

coefficients are insignificant, the null hypothesis that the income trust industry portfolios are spanned cannot be rejected overall.

Finally, the structural separation of trusts is presented in Panel B of Table 3.2, which provides a different viewpoint with respect to the efficient frontier. The royalty trusts, which demonstrate significantly lower volatility than the investment trusts, are also more poorly fit with the spanning regression. The percent of variation in returns explained by the unconstrained regression model is lowest for this grouping of income trusts ($R^2$ = 57 %). The intercept is greater than that of the investment trusts but is significant only at the ten percent level when compared to the residual error. The investment trusts have a more significant intercept but the TSX sub-index coefficients sum to 0.824, which is quite close to the null hypothesis value of unity, and seventy-five percent of the variation in returns is explained by the model. Though the structures present differing results, the calculated F statistic for the overall spanning model is not significant (F = 0.843), based on this equally-weighted compilation of trusts into structure-based portfolios. From several angles, we have investigated the performance of income trusts to determine that volatility is lower but the return is commensurate with the level of risk as established in the Canadian stock market.

## 3.6 Conclusion

Income trusts have been found to be less volatile than a comparable group of firms trading as stocks. Within the income trust market sector, those structured as royalty trusts are less volatile than investment trusts. Although some order is depicted in the risk associated with the major industry classes of trusts, a separation of volatility by sector classification cannot be established in a statistical sense, primarily due to dispersion of data from the REIT sector. It may be possible for investors to reduce risk, however, by investing in certain types of income trusts, primarily in the utility and oil and gas sectors. We find that the earned return for such a strategy is not extraordinary; it is expected to be above that received from low risk fixed-income securities, as indicated by the positive non-normal portfolio performance measures, and below that returned by a riskier stock portfolio.

The study demonstrates that income trusts do exhibit lower volatilities than other equities on the major stock exchanges in similar businesses. This aspect of the unit returns is seldom reported with respect to the security class, though it does hold value in a risk-averse investment community. In this chapter, we do not find substantially greater risk shown by unsuitable candidates that have reorganized in the recent proliferation of income trusts under the general business classification. As illustrated by the performance measures and spanning tests, the valuation of income trusts in the market corresponds well to a similar set of securities and to the composite sub-indexes. In this respect, a pricing bubble related solely to the trust sector is unlikely. Specific to

the income trust market segment, we find that the industry type, trust structure, and the size of the distribution influence the risk of the investment.

From a practical standpoint, the risk-return performance ratios of income trusts are no different than those of the matched set of firms, as would be expected in an efficient market. However, a more risk-averse clientele in the market may consider the potential for moderate returns at lower volatilities as an attractive investment alternative. We have demonstrated that either the utility and oil and gas sectors or the royalty structure could be targeted to provide a good probability of positive returns clustered in a region of reduced risk. As demonstrated through the spanning exercise, however, the return provided by such an investment strategy could be replicated at similar risk by a suitable combination of the TSX sub-indices. Although historical volatility is unlikely to be a useful predictor of future volatility, its use as a response variable in the current study has illustrated several important characteristics of Canadian income trusts.

# Chapter 4

## Factors Affecting the Volatility of Income Trusts


### 4.0 Abstract

In an empirical study of 230 income trusts listed in Canada, robust bootstrap estimation is used to condition a regression model that explains more than thirty percent of the variation in volatility, based on firm characteristics that are publicly known. Among income trusts, those that pay distributions as a 'top-line' expense in a royalty structure exhibit less volatility than those that adopt the investment trust structure, where distributions are payouts for equity and subordinated debt holdings. Trusts that focus on specific industrial sectors such as REITs and utility trusts are significantly less volatile than the more general, business classification. Although there has been a significant rise in volatility in three of the last four years in this popular segment of the Canadian market, we do not find evidence of improper valuation of trusts based on our chosen proxies - goodwill over total assets and cash constraint. For investors seeking moderate returns from relatively stable investments, this paper provides a model for reducing risk in an investment portfolio by choosing certain income trust units.

## 4.1 Introduction

In recent years, Income Trusts burst into the Canadian securities market. Despite their popularity, however, this type of security has suffered negative criticism as a viable investment due to both the marketing approach and the demographic of the purchasers, who are primarily retail investors. Income trusts are 'flow-through' structures resulting in distributions much larger than comparable dividend streams and these payments are only taxed once, at investors' personal rates. Thus the securities have become popular with income dependent investors in low tax brackets or those that can avail themselves of tax-shelters. If the distributions were stable, then income trusts might provide a unique niche in the marketplace. Until now, there has been no assurance that these securities are any less volatile than comparable investments. This study quantitatively determines the factors that contribute to the risk of the currently listed income trusts in Canada.

We contribute to the literature on income trusts in two ways. First, the volatilities of income trusts are related to choices made during the reorganization of the firm. The chosen characteristics of trusts are collected from published annual reports and volatility effects are estimated for these factors using a 'boot-strapped' linear regression technique. We include a trust specific marketing proxy and an overvaluation proxy appropriate for low growth firms. Secondly, the regressions test for any volatility increase evidenced in recent years, which might suggest that unsuitable firms are reorganizing into trusts in response to a 'hot' market.

Income trusts have been found to be less risky securities than comparable stocks in general[36] and there is now some ability to predict income trust volatility based on publicly documented attributes. Over thirty percent of the variation in volatility can be explained by the best model found, and results have been checked for robustness with respect to the error distribution. We do find a significant increase in volatility associated with newer trusts, particularly those that have been introduced in recent years into strong IPO markets.

The rest of the paper is organized as follows. Section 4.2 describes the current literature available on volatility and income trusts. Section 4.3 introduces their situation in the Canadian market and outlines the choice of independent variables included in the regression model. The methodology is covered in Section 4.4, which leads to the results discussed in Section 4.5. Section 4.6 concludes the study.

## 4.2 Literature Review

In recent years income trusts have gained increasing importance in the Canadian securities market as they comprise the largest and most frequent type of initial public offering.[37] The structure allows a mature firm to avoid taxation at the corporate level by allocating substantial royalty or interest expenses to the unit holder, who is taxed once on these proceeds. General descriptions of income trusts and trust structures have

[36] Chapter 3 provides an in depth discussion of this.
[37] "IPO activity set to tumble in wake of trust crackdown", *The Globe & Mail* (January 5, 2007).

been provided at investor conference proceedings, in the news media and in industrially sponsored reports, such as Halpern and Norli (2004), Lee (2002), and the Canadian REIT Guide (Deloitte and Touche(2002)). King (2003) provides a deeper description of the trust industry and raises the concern about the health of a market where the clientele are primarily retail investors. With institutional investors underrepresented, the effective monitoring by the market may be suspect. Limited oversight may be required, however, when an established operating company pays out the majority of its cash flows to investors.

Granted, evidence of heightened market activity is available. There is currently a strong demand for income yield over investment growth.[38] Klassen and Mescall (2005) develop a theoretical model of income trusts, improving Dempsey's (2001) discounted cash flow approach, to predict the appropriate clientele for the income trust sector. Investors in lower tax brackets should prefer these securities. With a large proportion of the Canadian population now reaching retirement age, this type of investor is common and their pension funds are powerful. From a supply perspective, both King (2003) and Halpern and Norli (2004) suggest that the recent popularity of the trust organizational form may motivate unsuitable firms to convert to the income trust structure, in search of tax savings and higher valuation. Mintz and Richardson (2006) echo this sentiment and further suggest that the quest for tax advantages leads to poor business and investment decisions. Huson and Pazzaglia (2006a, 2006b) study the initial public offering (IPO) process and find improved valuation accompanying the

[38] "The uneasy crown", *The Economist* (February 10-17, 2007).

transformation, significant indicators of market timing, and higher fees exacted by investment banks relative to non-trust IPO's. Finally, Zetzsche (2005) highlights the aggressive marketing efforts associated with trust securities at a time when income recognition is a high priority for retail investors and asserts that such influences could lead to a pricing 'bubble' in the income trust sector of the market. Thus the firm structure, originally designed to reduce taxation in several focused sectors of the economy, has become a source of controversy due to its short-term dominance of the Canadian market.

The movement towards income trusts, however, is not unexpected from a theoretical standpoint. Jensen (1989) argues that leveraged buy-outs (LBO's) and LBO-like organizations could supplant more typical corporate forms in mature industries.[39] From an agency theory perspective, release of the cash flows from the organization disciplines managers to invest wisely. Johnson (1995) finds that dividends and debt coverage are effective substitutes for reducing excess cash in the organization, whereas Ravid and Sarig (1991) find that better firms pay higher dividends and are more highly leveraged. Indeed, the large payout ratios of income trusts may provide the limiting case for such conclusions. The effect of the tax code is to provide preferential treatment to debt financing in balancing the payout and Ravid and Sarig conclude that under conditions of information symmetry, no dividend payment would be expected and each firm would migrate towards its optimal level of debt financing. For a mature firm with stable cash generation, this level could be quite high. Easterbrook (1984) and

[39] To a large extent this fashioned argument on leveraged buy-outs borrows strongly from his previous academic work on agency theory and free cash flow (Jensen (1986), Jensen and Meckling (1978)).

Rozeff (1982) posit that the benefit of the higher payout derives from increased monitoring by the external market, since managers must seek financing for investment when excess cash is unavailable internally. Unlike a true LBO, income trusts do trade publicly and are often successful at raising additional funds after the original IPO or conversion. Rappaport (1990) raises the need for such financial flexibility as a main argument counter to Jensen's (1989) assertion with respect to a transition in organizational form. Thus income trusts may fill a void for continued operation of mature firms, in much the same way as leveraged buy-outs revitalized the economy in the late 1980's.

Is continued operation a good thing? Lambrecht and Myers (2007) use a real options approach to demonstrate that in a declining economy, managers will operate a firm beyond the optimum point of disinvestment. Due to the cost of initiating a collective action, the shareholders or unit-holders are unable to affect this same result and hostile takeovers are required to motivate firm closure at an efficient point. The authors predict that regular dividends are likely in these cases and the equity claims are not unlike perpetual debt contracts. Managers will support this payment foregoing their own rents in order to extend the firm's operation. In the Lambrecht and Myers model, only sufficient debt can affect the same result and negate the role of takeovers. In support of this reasoning, the income trust has been employed as a takeover defense[40] and the nature of the distributions is also appropriate, with payments possible from return of capital and supported by the corporate tax savings. These sources act as

[40] Fording Coal reorganized as a trust for this purpose, after separation from the CP Rail conglomerate.

buffers to be used prior to the loss of any management rents. In a declining economy, the income trust organization may be able to continue operation beyond the time of efficient closure.

The greater financial concern is whether this corporate form contributes to market instability, and there has been a surge of IPO activity involving income trusts in Canada. Lowry and Schwert (2002) find that similar types of firms tend to go public at the same time simply because familiarity provides a better opportunity to raise money, consistent with Ritter (1984a). As information is revealed to the market during the registration period, all firms benefit from the dissemination, and a greater number of public offerings becomes more likely. Further, Persons and Warther (1997) find that firms rationally condition their decision on the outcomes of recent IPO's. These authors consider financial innovations, such as the LBO in the 1980's, based on the two criteria: 1) information on innovation value must come from the experience of adopters, and 2) adoption by one firm must not affect the profitability of adoption by others. As these conditions hold for income trusts, everyone understands which firms are best suited to the financial innovation and we should observe clustering of adoption in certain periods. Further, the authors suggest that the innovators are considered to provide a welfare function. Generally, income trusts have not been aggressively marketed by investment strategists to provide greater likelihood for a pricing "bubble" as posed by Zetzsche (2005). Rather the trusts are often offered for purchase in the range of ten dollars per unit and have paid out close to ten percent in recent years, which makes the investment affordable and relatively easy to value using discounted

cash flow techniques. Though a simple investment cannot provide for the absence of mispricing, Hershleifer (2001) suggests that in a liquid market mispricing should not persist. Based on the collected results, income trusts do not seem to indicate an overly great risk of destabilizing the market.[41]

In the area of portfolio theory, Cleary and MacKinnon (2006) have positioned income trusts within the Canadian security market, to find that trusts align more closely with equities than bonds based on correlation between the indexes. Further, the authors indicate only a small improvement in the efficient frontier when trusts are included. In the Chapter 3, we find income trusts to be less volatile than a matched set of firms of similar size in similar industries. Consistent with the work of Cleary and McKinnon, however, none of the four categories of income trusts significantly extends the efficient frontier for portfolio selection despite marked clustering of similar trust types in the relatively low volatility region of the risk-return space. In a study restricted to two classes of income trusts, Klassen and MacDonald (2005) find little evidence that firms with lower volatility measures choose to convert to trusts, in opposition to the widely held belief that income trusts are inherently stable firms. With utility trusts and real estate investment trusts (REITs) excluded from consideration, however, their results stem from a sample of 93 trusts from the resource and business classifications. For a more general conclusion in this area, a more comprehensive survey may be necessary. In the low volatility region of the risk-return space, the income trusts do enhance the

[41] In fact, a number of income trust securities were included in the TSX composite index in February, 2006.

portfolio selection opportunities, but to this date, no extraordinary contribution has been found.

The income trust pays essentially all of its cash flow to the unit holders in regular distributions that are generally predicted not to drop in the future. From this standpoint, the most likely operations to become income trusts are established companies with stable cash flows. Stability in returns, earnings, and cash flows can all be measured analytically by the variance estimates of these properties, which should all be interrelated to some extent. Volatility measured as the annualized square root of the variance of stock returns has been studied extensively and has been chosen as a suitable proxy for risk here. Above, the expected relationships between 1) payout levels and risk, and 2) liquidity and risk have been briefly described. This study also adds to the literature by estimating the income trust volatility relationship with respect to firm age, firm size, financial leverage, retained ownership, and accounting goodwill. To establish our expectations in these areas, the extant literature on the effects of these variables based on non-trust firms is summarized below.

Much of the recent work relating risk with age derives from the theory of firm learning proposed by Jovanovic (1982), who finds that younger firms have more variability in growth rates.[42] More recently, Pastor and Veronesi (2003) base their model on Bayesian updating by investors to obtain a closed form solution to their learning problem. They find that older firms have lower volatilities as profitability and

[42] See also Evans (1987), and Cooley and Quadrini (2001).

technological opportunities are reduced over time. The authors demonstrate that younger firms and firms that pay no dividends have more volatile returns. When distributions are considered, Lewellen and Shanken (2002) find that learning about an unknown dividend payout results in reduced volatility for older firms. Since there is uncertainty in the signal and the investors can only learn through trading activity, the econometric average tendency is only gradually revealed over time. Agarwal and Gort (2002) similarly find that hazard rates related to bankruptcy decrease with age over the first eight years of a firm's existence. In a study of family owned firms, Anderson and Reeb (2003) find that the founding members of a firm contribute a lesser effect to assist firm performance as the firm ages and profitability drops off. These compiled results indicate that a firm that is older and capable of paying a dividend should have less variance in its returns. The investment community will learn of firm quality in time as the ability to pay distributions is revealed and bankruptcy is avoided.

Dating back at least to Banz (1981), the size effect has been related to asymmetric information in the corporation. Merton (1987) constructs an argument in which the increase in the relative size of the investor base reduces cost of capital and increases the market value of a firm due to reduction in the information asymmetry. Evan's (1987) learning study associated with growth rates also accommodates size, measured as firm employment, and he finds that firm growth decreases with firm age and firm size. More recently, Cooley and Quadrini (2001) study chosen dynamics of growth, job reallocation, and exit with relation to the initial size of the firm and its age. These three measures, which are often associated with volatility, are negatively correlated with both

size and age. Similar to age, based on arguments of information asymmetry, firms of greater size are expected to be less volatile and prime candidates for successful income trust conversion.

$$\sigma_S = \sigma_V \left(1 + \frac{B}{S}\right) \tag{8}$$

where $\sigma_S$ is the volatility of the stock,
$\sigma_V$ is the volatility of the firm,
B is the value of debt,
and S is the value of equity (ie. B/S is the financial leverage ratio).

Equation (8) is derived by algebraic manipulation of the firm variance relation with an assumption of riskless debt financing. It indicates that greater financial leverage should increase the volatility of stock returns. Several time series studies also show a positive relationship, known as the 'leverage effect'. Financial leverage has been strongly associated with increased volatility since the often cited address of Black (1976), in which he relates observed negative effect on stock returns to higher leverage, thus higher volatility. Though Black does not presume a model, his inquiry into causation effects sets a suitable foundation for further work linking leverage and risk. Christie (1982) attributes the reverse reactions in stock returns and variances directly to financial leverage. In his thorough econometric analysis of financial leverage and interest rate, volatility is found to be an increasing function of leverage at a decreasing rate. Schwert's (1989) main aim is to characterize aggregate volatility through the time period of 1885 to 1987, using a technique similar to an autoregressive conditional heteroskedasticity (ARCH) model, but he includes financial leverage to relate to the previously noted work. Volatility is affected significantly by financial leverage in this data but it makes a small contribution to the overall result when other macroeconomic

factors are considered. Duffee (1995) returns to the study of leverage, analyzing data at the firm level, and he increases the sample to include smaller and less levered corporations. Using still more sophisticated econometric time series techniques, Duffee concludes that the effect of financial leverage cannot be solely responsible for the high negative correlation between stock returns and stock variance. As data and time series techniques have improved and computational ability has increased, the econometric study of leverage indicates a lesser, yet measurable effect.

Most studies of retained ownership indicate that superior performance and growth accompany an ownership stake in the firm. Founding families and managers with sizeable stock holdings have interests aligned with the external shareholders and thus growth benefits all parties. Leland and Pyle (1977) develop an early model that indicates an entrepreneur's willingness to invest can provide a signal of the quality of the projects that a firm is considering. The signal overcomes the moral hazard problem posed by inside information and a higher level of investment correlates with higher growth prospects, arising from projects of greater specific risk. Additionally, Leland and Pyle assert that debt cannot replace share ownership as a credible signal. Several years later, Downes and Heinkel (1982) provide the empirical evidence to support the Leland and Pyle conclusion. However, Ritter (1984b) poses two alternate hypotheses to signaling: one from agency theory and another from a welfare perspective. In testing the three competing models he finds that the agency theory hypothesis is supported empirically. Higher retained ownership is positively related to higher project growth. Finally, Krinsky and Rotenberg (1989) test the signaling hypothesis using Canadian

data with the objective of studying a more uniform group of firms. After upgrading the econometric approach and incorporating other information-based effects such as quality of underwriting, accounting disclosures, and the use of IPO proceeds, these authors find no discernable effect of retained ownership when testing the parameters of the Leland and Pyle (1977) model. Thus this stream of literature tends to support higher ownership relating to higher risk, though the empirical support for the original signaling model has shown mixed results.

In more recent work, retained ownership has been combined with other firm characteristics. Jensen, Solberg, and Zorn (1992) carry out a cross-sectional study of insider ownership, dividend payout, and debt financing policies using a simultaneous system of equations. These authors find that the level of retained ownership negatively influences both the debt and dividend policies, which substitute for one another. By also considering 'real' attributes of business risk, firm size, growth, profitability, and research and development expenses, Jensen et al. (1992) propose a modified 'pecking order' theory in which bankruptcy and agency costs also contribute to financial policy. Bajaj, Chan, and Dasgupta (1998) extend the signaling model of Leland and Pyle (1977) to include a degree of perquisite consumption and solve the close-form problem with a concave production technology and a mean-variance utility function to capture risk-aversion for the entrepreneur. Their result is consistent with previous work that higher levels of insider ownership result in higher performance, as measured by the productivity and Q-ratios, in the presence of debt financing. Anderson and Reeb (2003) find that the ability for founding families to improve productivity decreases over time

but there is a significant positive effect on profitability for both young and old firms. Even when competing explanations and interactive forces are considered, greater retained ownership by insiders indicates higher growth prospects, or increased volatility.

Income trusts that are formed through an IPO process carry a substantial amount of goodwill on their balance sheets, since proceeds of the public offering are used to purchase existing companies that are valued well above the book amount of existing assets.[43] The literature connecting accounting goodwill to stock performance is scant, but a negligible effect might be expected where the valuation in a merger is appropriate, reflecting efficient capital markets. Park (2002) studies the goodwill effect in a sample of thrifts in an event study, where the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA)[44] provides a shock to the banking system. Park uncovers only a secondary effect of goodwill, requiring a low capital balance in addition to higher goodwill to reduce the thrift's value. Although this result is narrowly focused on a single sector, the sample of thrifts provides appropriate data to test the effect of goodwill, as previously arranged mergers in an ailing industry resulted in sizeable levels of goodwill due to the purchase accounting method. Akerlof and Romer (1993) indicate that the significant amount of goodwill in thrifts decreases the real value of the firm sufficiently to motivate owners to face bankruptcy for profit, an opportunistic process that they describe as looting. However, the net effect of this

[43] It is noted that many companies that convert into income trusts have valuable and recognizable brand associations, but the goodwill recorded does not include either brand or other intangible assets.
[44] FIRREA tightened the definition of regulatory capital to reduce the beneficial effect of carrying goodwill for banks and thrifts. The capital gap between regulatory capital and economic capital was reduced and an embedded put option related to the prior capital difference decreased in value.

behaviour is predicted to be underinvestment, and therefore volatility would not be increased until the organization faces bankruptcy. Unless reporting of goodwill is extremely high and associated with another significant financial concern, its effect on volatility is expected to be minimal.

Based on fair valuation of the producing assets of the underlying corporation, a mature firm converting to an income trust should not exhibit greater volatility than a comparable public corporation. Tax benefits of higher leverage and investors' desire for income support the substantial payouts which income trusts offer and create a higher valuation in the market for mature firms with steady cash flows. Although the situation of trusts in the Canadian market is expected due to the strong market forces driving conversion, these corporate forms remain controversial and are considered risky.[45] By analyzing the volatility of this class of securities, we hope to identify differences between these and other common stock investments and to define the known firm characteristics that contribute to risk. For comparison, the noted Finance literature provides a thorough description of the expected effects on public companies for all variables considered in this study.

## 4.3 Problem Definition

The support for trusts lies in the literature concerning reduction of agency costs in the corporation (Jensen (1986,1989), Jensen and Meckling (1978)). To understand the level of efficiency that might be gained, Fama and French (2001) find that U.S. firms

[45] "S&P slams income trust reports, information risks abound" *The Globe and Mail* (January 17, 2006).

pay dividends on average at forty-three percent of earnings over a twenty-five year period of study. Canadian firms may be assumed to pay out in similar or lesser ratios. Therefore an agency cost reduction of at least half of stated earnings may be available for a profitable organization with limited investment opportunities. In their lifecycle, more mature operations should eventually reach a condition of moderate but dependable cash flow and these firms would be prime candidates for trust conversions. Since income trust reorganizations are financial innovations that satisfy the criteria set by Persons and Warther (1997), the investment community should also recognize suitable candidates and value these appropriately.

On the other hand, a waiting clientele for investment in high income securities does exist due to recent market sentiment and the demographic of the investing population. As the 'baby boom' moves into retirement, the demand for a steady income stream has increased and coincidently, scandal has taken the shine off several bell-weather growth stocks in the market.[46] Pension funds wield the might of great capital reserves, and acting as the tax-protected agents for the same age cohort of the population, also benefit from the higher pre-tax returns afforded by the flow-through nature of income trusts. Zetzsche (2005) argues that such strong demand and aggressive marketing of trusts provides the potential for a pricing bubble.

We aim to investigate the effect of the increase in trust reorganizations in recent years in a balanced manner by specifically assessing the determinants of risk for the sector.

[46] Enron, Worldcom, and Nortel were found, in varying degrees, to be falsely reporting on their success.

Although popularity has surged in the past four years, conventional trusts in the real estate (REIT) and the resource sector have existed for many years. Typically resource trusts adopt a royalty structure, previously described in Figure 3.1. These firms invest in proven, producing assets to ensure stable, 'top-line' distributions of cash for investors, albeit on a slowly depleting asset. The riskier, exploration side of the business is carried on by other players in the private or public market. In a similar fashion, REITs invest in the management and ownership of existing real estate properties at acceptable risk levels, while foregoing the uncertainties of the land development business. However, the trust landscape in Canada has changed to include other businesses beyond the two traditional types.

REITs have sharpened focus by investing in more specific property types such as hotels, apartments, and retirement homes. Oil and gas trusts are no longer solely defined as royalty structures and some describe exploratory activity within their mandate in the annual report. In response to deregulation throughout the sector, utility trusts[47] have become an increasing presence in the market and all of these trusts have adopted an investment structure similar to REITs, as shown in Figure 3.2. Business trusts make up the final industry category, a catch-all for operations ranging from transportation and storage to ice, retail liquor, and convenience stores. In the business classification, there are energy services firms that contract primarily to the oil and gas sector and restaurants that have adopted the royalty structure to capture the value of their brands. Thus there is great diversity in the kinds of companies that now make up

[47] Utility trusts include those trusts described as 'power & pipeline' entities but more recently these have been joined by telecommunication players, particularly those focused on land-line transmissions.

the total number of trusts in Canada and volatility is expected to depend on the trust type.

Regression analysis is used to determine the effects of multiple independent variables in four separate models. The first regression model, introduced as equation (3) in the previous chapter, includes the various types of trusts using indicator or 'dummy' variables. The structural dimension is indicated by the variable ROYALTY, which is unity where a 'top-line' royalty structure is adopted and zero if the organization is an investment trust. REIT, UTILITY, and OG are variables used to indicate the classifications of the income trusts in the focused industrial sectors. When the 'dummy' variables are all set to zero, the more general business investment classification applies. In this study, OG is specific to firms involved primarily in the production side of the oil and gas sector, which corresponds closely to the original classification of resource trusts.[48]

$$\sigma = \beta_0 + \beta_1 ROYALTY + \beta_2 REIT + \beta_3 UTILITY + \beta_4 OG + \varepsilon \qquad (3)$$

where σ is the empirical estimate of historic volatility from Feb. 2004 to Feb. 2006,
ROYALTY indicates a royalty structure rather than an investment structure,
REIT indicates a real estate investment trust rather than a business trust,
UTILITY indicates a utility trust rather than a business trust,
OG indicates an oil and gas production trust rather than a business trust,
and ε is the error term.

The trust type indicators are modeled in the absence of other effects in equation (3) and are also included in each of the complete regression models, shown as equations (9),

[48] www.investcom.com includes the services firms in their classification of resource trusts and other authors have included other raw materials such as coal or iron ore in the resource class.

(10), and (11). For ease of description, similar variables have been collected on separate lines in the equation format and each group is described below.

$$\begin{aligned}\sigma = \beta_0 &+ \beta_1 ROYALTY + \beta_2 REIT + \beta_3 UTILITY + \beta_4 OG \\ &+ \beta_5 GWASSET + \beta_6 LIABASSET + \beta_7 CASHCONST \\ &+ \beta_8 TARGET + \beta_9 PARENTOWN + \beta_{10} PAYOUT \\ &+ \beta_{11} TENURE + \varepsilon \end{aligned} \quad (9)$$

where GWASSET is the ratio of goodwill to total assets in first annual report,
LIABASSET is the ratio of total liabilities to total assets in first annual report,
CASHCONST is the ratio of funds needed for reorganization to funds raised in IPO,
TARGET indicates that payout target is between 10-13% annually,
PARENTOWN is percent retained ownership by the principle after reorganization,
PAYOUT is the percentage of 'distributable cash' paid out,
and TENURE is the difference between the date of inception and July 31, 2006.

The reorganization into a trust can occur either by direct conversion of common stock into trust units in a continuation of the operating entity or through an issue of new trust units, essentially an initial public offering (IPO). In the trust market, conversions without a public offering have been carried out primarily in the oil and gas sector. If an IPO is the chosen method, then several variables are interesting in the valuation of the resulting trust. The cash amount raised in the offering may relate to the possible overpayment for assets, the reduction of liability, or the ability to pay distributions. All of these effects are gathered on the second line of equation (9).

Overpayment for assets is a possibility in the income trust IPO since an existing firm or its brand is acquired by the trust with the proceeds from the offering and this gives rise to a statement of goodwill on the balance sheet of the income trust in its first annual report.

Since income trusts are used as an exit strategy for private investors and public firms, it is possible that the price at which the trust is offered to the market may be too high. In this case, the difference in the amount paid for the assets over their recognized book value, which already includes intangible assets and brands, provides a suitable proxy. If the assets are purchased solely to generate cash flow without any significant growth prospects, then a purchase price above the recognized book-value could constitute an overpayment. Akerlof and Romer (1993) indicate that a large misstatement of value above the fundamental amount provides an incentive for owners to seek profit through bankruptcy. GWASSET is the ratio of goodwill to the total assets from the income trust's first annual report. If the regression coefficient is found to be significantly positive, then there is an indication that income trusts have been selling above fundamental value, which adds to price volatility: a result aligning with the pricing 'bubble' scenario. If the coefficient is insignificant, then asset valuation at the time of the IPO would appear to be correct. Tax savings are a potential low risk cause for enhanced value not previously recognized by the corporation.

The unit offering also provides an opportunity for the underlying operations to refinance, giving rise to two other variables related to capital structure. If the income trust uses the IPO to raise enough capital to reduce the leverage of the firm, then the distributions will be subordinated payments to a lesser extent and the volatility of the trust should also be reduced. LIABASSET is the ratio of liabilities, excluding distributions payable, to the total assets of the firm from the balance sheet of the first annual report. Based on previous

work relating leverage to risk, it is expected that volatility will increase as external liabilities rise and this variable will have a positive coefficient in the regression.

When the initial public offering raises enough capital to cover all costs of the acquisition of underlying assets, the income trust begins operation in a less strained financial situation. Further, any excess capital can be used to stabilize distributions as 'return of capital', a tax-deferred component realized by the unitholders at the time of claiming a capital gain on the investment. Both the value of the acquisition and the proceeds from the public offering are known. CASHCONST is the calculated ratio of the reported cash required for the acquisition over the cash raised in the IPO. This variable is expected to increase volatility, resulting in a significant positive regression coefficient estimate.

In the third line of the regression model (9), the next group of factors corresponds to the distributions paid by income trusts, generally on a monthly basis. Recent unit IPO's have been priced at ten dollars ($CAD) in the market, and often the annual payout is set at a target between $1.00 and $1.30. As a result, investors' expectations for distributions may approach this range and a successful marketing scheme would be to advertise income payouts between ten and thirteen percent annually to meet market demand. TARGET is an indicator variable that takes the value of unity if the initial unit price is ten dollars and the payout is in the 10-13% range and zero otherwise. The effect of this variable is uncertain. If the income trust were to set such a target at inception and could not make the payments, then volatility would be expected to increase. A significant positive coefficient would support the argument that recent sales of income trusts have been

aggressively marketed and thus returns are prone to higher volatility, as in a pricing bubble. On the other hand, if the income trust sets such a target to meet investors' expectations and then organizes to ensure that distributions can be sustained at that level, then return volatility should be reduced. Units would be held preferentially by satisfied investors and a fairly liquid market in affordable securities would prevail. This result follows from rational investment behaviour and would align well with income trust IPO underpricing literature that has found trusts to be properly valued at inception, rarely underpriced.[49] In this case, a significant negative coefficient is expected and the bubble theory would lack support.

A second consideration in the stability of income trust payouts is the amount of ownership that the original parent or partners retain as a minority interest in the endeavour. The fraction is often held in subordinated shares that can be exchanged for trust units sometime in the future. From the notes to the financial statements in annual reports, these shares are often subordinated with respect to the trust units, whose debt is in turn subordinated to the primary creditors. In this way distributions to trust unitholders could be sustained in periods when cash flow is insufficient to pay the expected distribution to all equity holders. The tactic of management withholding its own compensation is predicted by the real options model of suboptimal disinvestment in a declining economy proposed by Lambrecht and Myers (2007). PARENTOWN reflects the fractional ownership retained by the original parent in the income trust. It is expected that higher parent ownership will reduce the volatility of the income trusts, since

[49] Please see James (2003), James, How and Izan (1994) or Jog and Wang (2004).

distribution levels can be more easily stabilized when the cash flow is guaranteed only to the external investors. However, as no evidence in the annual reports details that the minority interest will be compensated at a lower level than other unitholders, an insignificant or positive coefficient is also possible. The positive effect would be expected for normal corporate forms, where increased insider ownership translates into increased growth prospects or higher volatility.

The final attribute corresponding to the distribution is the payout ratio that is established in the first year of the trust's operation. Most income trusts claim to pay distributions of essentially all of their free cash flow to unitholders but this can range from a fraction of the calculated 'distributable cash' to multiples of actual cash generated in the first year. PAYOUT is the ratio of the actual distribution declared in the first year of the income trust's operation over the 'distributable cash' reported in the financial reports.[50] The payout ratios seldom change materially throughout the trust's tenure and often the actual payouts match exactly with targets expressed in the annual reports. It is expected that volatility will rise as the payout ratio rises, particularly as it exceeds unity and other available cash is depleted to maintain distributions. This variable should have a significant positive coefficient.

Equation (9) relates the length of time that an income trust has been operating to volatility, in the presence of the previously described variables. If a firm has been able to

[50] 'Distributable cash' is a non-GAAP item that is calculated by the trust sector and it has been the focus of some criticism since its calculation is not consistent among firms. However, the item was in all cases available in the annual reports and for the purpose of this study, the behavior of the trust's management is actually indicated by the amount of the distributions declared with respect to the amount that the trustees believe to be available, so the factor maintains its informational content.

maintain stable distributions for several years, then it is likely to continue to meet that level of cash payout. The investment community will develop better knowledge on the level of distributions gradually over time, as described by Lewellen and Shanken (2002), and volatility will be reduced with the increase of information. The final variable in the first complete model is the time period over which the trust had been operating. TENURE is the time measured in years from the trust's inception to July 31, 2006. A significant negative coefficient is expected for this variable, based on the research on firm age and learning.

In equation (9), TENURE may also relate to the popularity of income trust securities in recent years. Trusts with tenures above five years predate the aforementioned scandals in the stock market and the observed desire for a steady income stream in a time of low interest rates. Certainly, these older trusts were not introduced into a 'hot' IPO market for the income trust sector. In order to separate those trusts introduced more rapidly in the most recent past from the linear effect associated with TENURE and learning, four indicator variables relating to the year of inception are introduced to replace TENURE in the model, as shown in equation (10) below. The variables Y05, Y04, Y03, and Y02 take the value unity if the years of inception are 2005, 2004, 2003, and 2002, respectively, and zero otherwise. If these indicator variables are positive, significant, and improve the fit of the model or the distribution of the residuals, then it is clear that the recent demand has been more important than the tenure of income trusts. Higher valuations due to demand may have forced reorganization of firms that are otherwise not suitable for the flow-

through structure, as suggested by King (2003) and Halpern and Norli (2004). Further, significant positive results lend support to the pricing bubble concern of Zetsche (2005).

$$\begin{aligned}\sigma = \beta_0 &+ \beta_1 ROYALTY + \beta_2 REIT + \beta_3 UTILITY + \beta_4 OG \\ &+ \beta_5 GWASSET + \beta_6 LIABASSET + \beta_7 CASHCONST \\ &+ \beta_8 TARGET + \beta_9 PARENTOWN + \beta_{10} PAYOUT \\ &+ \beta_{12} Y02 + \beta_{13} Y03 + \beta_{14} Y04 + \beta_{15} Y05 + \varepsilon \end{aligned} \quad (10)$$

where ROYALTY indicates a royalty structure rather than an investment structure,
REIT indicates a real estate investment trust rather than a business trust,
UTILITY indicates a utility trust rather than a business trust,
OG indicates an oil and gas production trust rather than a business trust,
GWASSET is the ratio of goodwill to total assets in first annual report,
LIABASSET is the ratio of total liabilities to total assets in first annual report,
CASHCONST is the ratio of funds needed for reorganization to funds raised in IPO,
TARGET indicates that payout target is between 10-13% annually,
PARENTOWN is percent retained ownership by the principle after reorganization,
PAYOUT is the percentage of 'distributable cash' paid out,
and Y02-Y05 indicate that the dates of inception are in 2002, 2003, 2004, or 2005.

The third complete model tested is included as equation (11), and in this case, the size of the income trust is considered. To this point, size has been excluded since it is highly collinear with both tenure/time and the oil and gas indicator variable. Oil and gas trusts are the oldest entrants in our sample of firms. These players have become well-established and have become relatively large through the strategy of building reserve life through continual acquisition of proven assets. Further, oil and gas prices have greatly increased in response to a strong world demand for energy, while facing a possible shortage in supply. SIZE is entered into the model as the natural logarithm of current market value for the trusts and it forces removal of the effects attributed to OG and TENURE due to multicollinearity concerns. Also, the time-based indicator variables associated with the last four years are affected and these cannot be included in the

regression. The relation of size to volatility is expected to be significant and negative based on past research.

$$\sigma = \beta_0 + \beta_1 ROYALTY + \beta_2 REIT + \beta_3 UTILITY + \beta_5 GWASSET + \beta_6 LIABASSET + \beta_7 CASHCONST + \beta_8 TARGET + \beta_9 PARENTOWN + \beta_{10} PAYOUT + \beta_{16} SIZE + \varepsilon \quad (11)$$

-where ROYALTY indicates a royalty structure rather than an investment structure,
REIT indicates a real estate investment trust rather than a business trust,
UTILITY indicates a utility trust rather than a business trust,
GWASSET is the ratio of goodwill to total assets in first annual report,
LIABASSET is the ratio of total liabilities to total assets in first annual report,
CASHCONST is the ratio of funds needed for reorganization to funds raised in IPO,
TARGET indicates that payout target is between 10-13% annually,
PARENTOWN is percent retained ownership by the principle after reorganization,
PAYOUT is the percentage of 'distributable cash' paid out,
& SIZE is the logarithm of market value in first quarter of 2006.

To summarize, the research will establish the risk of income trusts along several dimensions that are known to all investors from public sources. By fitting the four regression equations (3), (9), (10) and (11), we estimate responses to a series of important questions associated with income trusts. Do the different types of income trusts have different risk levels? Are the capital structure characteristics of the income trust capable of predicting the risk of the income trust? Is there evidence of overpayment for the underlying assets? Are characteristics of the distribution useful in determining the risk of the income trust? Have income trust volatilities increased over time? The results of this study will then provide a suitable foundation to evaluate the current status of income trusts in the Canadian market.

## 4.4 Methodology

The dataset is completely comprised of Canadian securities, as only Canada has allowed the income trust structure to be adopted across all sectors of industry. A complete listing of Canadian income trusts can be found at www.investcom.com. From this list, only trusts with inception dates prior to January 1, 2006 are included in the study. Datastream is the source of market value, daily price and daily distribution information for this list of 240 securities. For the results to be useful in forecasting volatility of the income trusts, all information is taken from sources available to the public. Income deposit securities, income paired securities, and trusts that have reorganized, primarily through mergers, are removed as the historical attributes of the underlying organizations could not reasonably be collected. In the process of model selection, the residual plots indicate the presence of two outliers that adversely influence the regression. FMF Capital and Huntingdon REIT are removed with the following justifications: the former trust has suspended distributions and is essentially bankrupt and the latter is a high influence point whose capitalization is extraordinarily low in the REIT sector. [51] As a result, the regression results are based on a final sample of 230 income trusts.

The following characteristics are recorded:

1. Market value [from Datastream 01/01/2006][52]
2. Inception date [also on www.investcom.com.]
3. Units issued/converted
4. Money raised (from an IPO or unit offering)
5. Money required (when an acquisition or expense is identified)

[51] FMF Capital Group Ltd. failed spectacularly in its first year of operation and underwriters were targeted in a class-action suit through the period of our study (DeCloet, D. "FMF Investors target BMO in suit …" The Globe & Mail (Dec. 6 2005)). Huntingdon REIT has a very low capitalization in the sector and is traded on the TSX Venture Exchange

[52] Unless otherwise indicated in the square parentheses, the independent variables were collected from annual reports available at sedar.com.

6. IPO indicator (0=conversion, 1=IPO, 2=conversion & unit offering)
7. Parent ownership (subordinated interest)
8. Declared Distributions
9. Distributable Cash
10. Target payout indicator (for firms issued at $10.00 per unit with payout $1-$1.30)
11. Goodwill
12. Liabilities less Distributions Payable
13. Total Assets
14. Sector Classification of Trust (REIT, Oil&Gas, Utility, or business)
15. Structure Type (1=royalty trust, 0=investment trust)

Then, the following variables are calculated from the collected information:

1. Tenure is (July 31, 2006 – Inception date) in years
2. Cash Constraint is (Money required)/(Money raised)
3. Payout Ratio is (Declared Distributions)/(Distributable Cash)
4. Goodwill/Assets is (Goodwill)/(Total Assets)
5. Liabilities/Assets is (Liabilities less Distributions Payable)/(Total Assets)

Our proxy for risk is estimated volatility, as calculated from two years of historical data as described in Hull (2003). The response variable for the regression models is a single volatility estimate for each trust calculated from the daily return data collected over the period from February 25, 2004 to February 24, 2006. This period ends prior to the inclusion of a number of income trusts in the TSX composite index. Linear regression is used to evaluate the models listed in equations (3) and (9) through (11) of the previous section, using the ordinary least squares methodology.[53] Equation (3) is fit exactly as described and a backwards step-wise approach is adopted to reduce each of the complete models described by equations (9), (10), and (11). The summary statistics for the continuous independent variables and correlation with volatility are presented in Table 4.1.

[53] As volatility cannot be negative, censored data was possible but Tobit estimation indicated no censored results in the dataset and coefficient estimates were unaffected.

## Table 4.1: Summary Statistics of Independent Variables

The sample includes 230 income trusts traded on the Toronto Stock Exchange over the period from February 25, 2004 to February 24, 2006. These firms have not been involved in merger activity and therefore, independent variables taken from the first annual report are deemed to adequately represent the state of the company. The dependent variable is the historical volatility estimate of returns in the sample period. Its correlation with the independent variables is included in the final column. Liabilities/Total Assets (LIABASSET) is the ratio of total liabilities less distributions payable to total assets from the balance sheet of the first annual report. Goodwill/Total Assets (GWASSET) is the ratio of goodwill to total assets from the balance sheet of the first annual report. Payout ratio (PAYOUT) is the ratio of cash distributed to 'distributable cash' as demonstrated in the first year of operation. Parent Ownership (PARENTOWN) is the amount of the trust held as exchangeable shares by the original firm owners. Cash Constraint (CASHCONST) is a ratio of the cash required for asset purchase at inception to the cash raised at that time. Tenure (TENURE) is the length of time that the trust has been operating, calculated as the difference between July 31, 2006 and the date of inception. Size (SIZE) is the natural logarithm of the market value of the income trust, collected from Datastream on March 1, 2006. Market values are reported again in the final row.

| Variable | Minimum | Mean (Median) | Maximum | Correlation with Volatility |
|---|---|---|---|---|
| **Liabilities/Total Assets** | **0** | **0.37 (.36)** | **0.95** | **0.186** |
| **Goodwill/Total Assets** | **0** | **0.16 (0.02)** | **0.80** | **0.027** |
| **Payout Ratio (%)** | **0** | **88 (90)** | **300** | **0.122** |
| **Parent Ownership (%)** | **0** | **30 (16)** | **85** | **0.030** |
| **Cash Constraint** | **0** | **0.91 (0.93)** | **5.17** | **-0.055** |
| **Tenure (years)** | **0.65** | **3.84 (3.11)** | **17.76** | **-0.212** |
| **Size = ln (MV)** | **1.5** | **5.65 (5.62)** | **9.60** | **-0.4027** |
| **Market Value ($ M)** | **4.48** | **729.6 (276.7)** | **14,710** | **-0.127** |

The regression results do allow a number of conclusions to be made based on subsets of the collected independent variables. However, there is evidence of multicollinearity when all variables of interest are included in a full model. The correlation matrix is presented in Table 4.2, with the concerns highlighted. First, the size of the trust, calculated as the natural logarithm of market value, is positively correlated with both the oil & gas indicator variable and the tenure of the trust. The tenure of the trust is

## Table 4.2: Correlation Coefficients between Independent Variables

The sample includes 230 income trusts traded on the Toronto Stock Exchange over the period from February 25, 2004 to February 24, 2006. These firms have not been involved in merger activity and therefore, independent variables taken from the first annual report are deemed to adequately represent the state of the company. The dependent variable is the volatility of returns and its correlation with the independent variables is included in the final column. Liab/Asset (LIABASSET) is the ratio of total liabilities less distributions payable to total assets from the balance sheet of the first annual report. GW/Total Assets (GWASSET) is the ratio of goodwill to total assets from the balance sheet of the first annual report. REIT is an indicator variable that takes value unity if the income trust is a REIT, and zero otherwise. OG is an indicator variable that takes value unity if the income trust is and oil or gas production operation, and zero otherwise. Utility is an indicator variable that takes value unity if the income trust is a utility trust, and zero otherwise. Target is an indicator variable that takes value unity if the income trust pays a target distribution between 10-13%, and zero otherwise. Payout ratio (PAYOUT) is the ratio of cash distributed to 'distributable cash' as demonstrated in the first year of operation. Parent Ownership (PARENTOWN) is the amount of the trust held as exchangeable shares by the original firm owners. Cash Constraint (CASHCONST) is a ratio of the cash required for asset purchase at inception to the cash raised at that time. Tenure (TENURE) is the length of time that the trust has been operating, calculated as the difference between July 31, 2006 and the date of inception. Size (SIZE) is the natural logarithm of the market value of the income trust, collected from Datastream on March 1, 2006. IPO is an indicator variable that takes value unity if the income trust was formed through an initial public offering, and zero otherwise. This variable was removed due to the multicollinearity in evidence in the final row, Panel B.

PANEL A: Included Factors

| | *Liab/A* | *GW/A* | *REIT* | *OG* | *Utility* | *Royalty* | *Target* | *Payout* | *PartOwn* | *CashCst* | *Tenure* | *Size* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Liab/Asset | 1 | | | | | | | | | | | |
| GW/Asset | -0.135 | 1 | | | | | | | | | | |
| REIT | 0.351 | -0.285 | 1 | | | | | | | | | |
| OG | -0.029 | -0.235 | -0.157 | 1 | | | | | | | | |
| Utility | -0.100 | -0.186 | -0.140 | -0.154 | 1 | | | | | | | |
| Royalty | -0.227 | -0.199 | -0.116 | 0.264 | -0.114 | 1 | | | | | | |
| Target | -0.023 | 0.231 | -0.077 | -0.245 | -0.096 | 0.079 | 1 | | | | | |
| Payout | 0.000 | -0.001 | 0.134 | -0.131 | 0.017 | 0.034 | 0.089 | 1 | | | | |
| ParentOwn | -0.057 | 0.163 | -0.126 | -0.167 | 0.120 | -0.092 | 0.052 | -0.057 | 1 | | | |
| CashConst | 0.103 | 0.124 | 0.279 | -0.287 | 0.152 | -0.019 | 0.196 | 0.141 | 0.157 | 1 | | |
| Tenure | -0.235 | -0.232 | 0.117 | 0.177 | 0.087 | 0.300 | -0.083 | 0.049 | -0.152 | 0.001 | 1 | |
| Size | -0.100 | -0.344 | 0.097 | **0.439** | 0.165 | 0.096 | -0.254 | -0.211 | -0.129 | -0.133 | **0.404** | 1 |

PANEL B: Removed Factor

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IPO | -0.057 | 0.200 | 0.207 | **-0.396** | 0.053 | -0.011 | 0.339 | 0.149 | 0.153 | **0.564** | 0.072 | -0.166 |

derived from the time of trust inception and therefore, it cannot be included with the indicators of the year of trust formation nor can these years be included with the size of the firm. These concerns lead to consideration of the three models in equations (9)-(11).

Initially, an IPO indicator variable is defined to flag the method of income trust reorganization, taking a value of unity if an initial public offering is involved and zero otherwise. It is included in Table 4.2, Panel B to illustrate the problems surrounding its collinearity with other trust characteristics. CASHCONST is a ratio calculated for income trusts that raise capital at inception and since those trusts involved in IPO's raised amounts very close to the required funding, this variable is highly correlated with the IPO indicator variable. Oil and gas trusts are generally conversions or continuations of previous operations, whereas IPO's are more common for the other sectors. This leads to a high negative correlation between OG the IPO indicator. At slightly lower significance, the IPO indicator is also correlated with TARGET, since these trusts are all initial public offerings with the common unit price of ten dollars ($CAD). Thus to solve these confounding problems the IPO effect has been removed but many of the important effects that relate to an IPO do remain in the model.

The final concern with the empirical methodology arises from the choice of a volatility estimate, our proxy for risk, as a response variable. Least squares methodology is most efficient where errors are normally distributed. However, the theoretical distribution of variance is $\chi^2$ and thus volatility will be distributed as a square-root transformation of a

right-skewed variable. To overcome this concern, several robustness measures were applied. Transformation of the response variable is carried out using two methods. Following Wright (1999), who successfully employed a logarithmic transformation to smooth variance in a time series, we first transform the response variable to the natural logarithm of volatility. Then the related, but more general Box-Cox power transformation is iteratively applied to obtain the best exponent based on the data. Results are evaluated by the improvements in regression estimation and analysis of residuals for normality.

Finally, the non-normal error structure affects any inference that is attempted in tests of significance. Thus the coefficient t-tests in the least squares estimation can overstate the significance of the findings. This problem is overcome numerically by using nonparametric methods of estimation and then assessing significance against pseudo-measures that are generated from the data themselves. In our case, the right-skewed residuals are handled by repeated regression analysis using the bootstrap technique and the formation of bias-corrected percentile intervals around each coefficient estimate to indicate whether the parameter is likely to be zero. Bootstrap intervals based on five hundred repeated samplings are calculated for all significant coefficients estimated in equations (9), (10), and (11).

## 4.5 Discussion of Results

The first analysis measures the combined effects of the royalty structure and the accepted industrial classification types relative to the business investment trust. This model is described in equation (3) and the result is included in Table 4.3 as Model I, where only 9.5% of the variation in the volatility measure is explained by the four indicator variables. Each indicator variable except OG is found to be significant and the model has acceptable significance as well. Oil and gas trusts show less effect on volatility when the royalty indicator is included. Newer oil and gas trusts are less likely to adopt the conventional royalty structure and may be involved in some exploration. As a result, these trusts show no significant reduction in volatility due to their classification relative to the business trusts. Since royalty trusts are only represented in the oil and gas and business sectors, this result also indicates that the structure, where 'top-line' royalty payments provide distributions, leads to more certainty in the income trust's performance. Equation (3) provides two early results, but enhancement is necessary to improve the distribution of the residuals, which exhibit heteroskedacticity. In residual plots not shown, variance changes over the prediction region with increased uncertainty around predictions on REITs and business trusts. Inclusion of further regressors resolves this concern.

Due to multicollinearity concerns described in the methodology section above, a full model including all effects cannot be tested. Most of the problem variable pairings are removed, however, when the income trust size is removed initially. The result from the complete model of equation (9) is presented as Model II in the second column of Table

## Table 4.3: Regression Results for Volatility with respect to Time

The sample includes 230 income trusts traded on the Toronto Stock Exchange over the period from February 24, 2004 to February 24, 2006. These firms have not been involved in merger activity and therefore, independent variables taken from the first annual report are deemed to adequately represent the state of the company. The dependent variable is the two–year historical volatility estimate of the unit returns and it is fit to the linear models using ordinary least squares (OLS). Utility, REIT, and Oil & Gas are indicator variables that take the value unity if the income trust is in that particular line of business, and zero otherwise. Royalty is an indicator variable that takes the value unity if the income trust is structured to pay distributions as a 'top-line' expense, and zero otherwise. Goodwill/TotalAssets is the ratio of goodwill to total assets from the balance sheet of the first annual report. Liabilities/TotalAssets is the ratio of total liabilities less distributions payable to total assets from the balance sheet of the first annual report. Target is an indicator variable that takes value unity if the income trust pays a distribution between 10-13%, and zero otherwise. Payout ratio is the ratio of cash distributed to 'distributable cash' as demonstrated in the first year of operation. Parent Ownership is the amount of the trust held as exchangeable shares by the original firm owners. Cash Constraint is a ratio of the cash required for asset purchase at inception to the cash raised at that time. Tenure is the length of time that the trust has been operating, calculated as the difference between July 31, 2006 and the date of inception. In Model IV, tenure is replaced with four indicator variables (2002, 2003, 2004, and 2005) that correspond to the years of inception for trusts formed in those recent years. A backwards stepwise procedure is used to remove all variables at less than 10% significance to produce Models III and IV. The final column contains the bias-corrected percentile bootstrap intervals for the significant coefficients of Model IV, containing the recent year indicator variables.

| **Variable** | **(I)**<br>**Trust Classes & Structure** | **(II)**<br>**Complete Model†** | **(III)**<br>**Tenure O&G** | **(IV)**<br>**Recent Years** | **(IVB)**<br>**Bootstrap 95% Intervals‡** |
|---|---|---|---|---|---|
| Utility | -0.118***<br>(-3.74) | -0.123***<br>(-3.61) | -0.113***<br>(-3.67) | -0.106***<br>(-3.40) | { -0.156, -0.070} |
| REIT | -0.081**<br>(-2.57) | -0.120***<br>(-3.16) | -0.117***<br>(-3.46) | -0.111***<br>(-3.27) | { -0.180, -0.038} |
| Oil & Gas | -0.048<br>(-1.59) | -0.066**<br>(-2.06) | -0.067**<br>(-2.23) | -0.063**<br>(-2.10) | { -0.114, -0.021} |
| Royalty | -0.092**<br>(-2.47) | -0.054<br>(-1.38) | | | |
| Goodwill/ TotalAssets | | -0.045<br>(-0.81) | | | |
| Liabilities/ TotalAssets | | 0.126**<br>(2.44) | 0.136***<br>(2.71) | 0.132***<br>(2.64) | { 0.018, 0.285} |
| Target Distribution | | -0.048**<br>(-2.21) | -0.058***<br>(-2.76) | -0.057**<br>(-2.72) | { -0.110, -0.019} |
| Payout Ratio | | 0.106***<br>(3.39) | 0.100***<br>(3.21) | 0.100***<br>(3.22) | **{ -0.009, 0.186}** |
| Parent Ownership | | 0.035<br>(0.72) | | | |
| Cash Constraint | | -0.013<br>(-0.86) | | | |
| Tenure | | -0.0057<br>(-1.57) | -0.0069**<br>(-1.98) | | |
| 2002 | | | | 0.052<br>(1.65) | { 0.003, 0.116} |
| 2003 | | | | 0.025<br>(0.77) | { -0.012, 0.070} |
| 2004 | | | | 0.064**<br>(2.02) | { 0.017, 0.134} |
| 2005 | | | | 0.073**<br>(2.41) | { 0.029, 0.122} |
| Constant | 0.340***<br>(25.79) | 0.257***<br>(5.87) | 0.249***<br>(6.40) | 0.177***<br>(4.45) | |
| F statistic<br>(p-value)<br>$R^2$<br>Adj. $R^2$ | 5.89<br>(0.0002)<br>0.0948<br>0.0787 | 4.92<br>(8E-7)<br>0.1988<br>0.1583 | 7.19<br>(9E-8)<br>0.1848<br>0.1591 | 5.37<br>(4E-7)<br>0.1969<br>0.1602 | |

The values presented in the table are coefficient estimates and t-scores in brackets, below. Significance is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating the 1% level.
† The complete model cannot incorporate size or IPO indicator due to multicollinearity restrictions.
‡ Bold-face intervals indicate coefficients that are found insignificant at 5% using the robust bootstrap procedure.

4.3. This estimation has the greatest number of independent variables included, prior to reduction by a manual, backwards step-wise procedure.

Similar to Model I, the classification indicator variables reduce the volatility measure. Inclusion of tenure in the model has reduced the contribution attributed to the royalty indicator, allowing the oil and gas indicator to establish a significant effect. Apart from this switching between OG and ROYALTY, the classification coefficients are relatively stable after the addition of other significant variables. The REIT indicator has changed the greatest amount with the inclusion of LIABASSET, since these trusts are usually highly levered. This explains one source of the higher residual variance in the REIT sector after fitting only the trust indicator variables in equation (3). Therefore the liability ratio increases the volatility reduction contributed by the REIT classification when compared to a business trust and the financial leverage has the expected effect of increasing the volatility of returns for all income trust types. These combined results suggest that business trusts are significantly more volatile than any of the other trust classifications when additional factors are included to reduce the residual variation.

Model II also indicates which effects are unlikely to affect volatility. The variables derived to indicate instability in the reorganization process both indicate insignificant effects. In this and all other models, the amount of goodwill on the balance sheet did not increase the volatility of the income trusts. In most of the data, goodwill results

from valuation of assets during the IPO process or from acquisitions of assets to form the operating basis of the trust. If there is no detrimental effect associated with the variable GWASSETS, then the amount of goodwill is assumed to be properly estimated in the case of income trusts. Thus the trust IPO proceeds have not been used to purchase over-valued assets and acquisitions during formation have been fairly valued. This rests well with the findings of various authors (James (2005), James et al. (1994), and Jog and Wang (2004)) who find no underperformance in trust returns following the IPO and with the result of Huson and Pazzaglia (2006b), who find that no discount is offered in the registration process for income trusts when compared to other IPO's. Although we have not tried to quantify the effect, the relatively large amounts of goodwill observed may be due to the anticipated, low risk tax savings. In this case, a negligible effect on volatility would be anticipated.

The cash constraint variable is introduced to reflect the amount of IPO or unit issue proceeds that are required to purchase the underlying assets of the trust. If the assets surpass the cash raised, then some further liability is required to meet the purchase agreement whereas, if the cash raised is above the purchase price, then a surplus is available to support distributions. There is no significant effect of this variable on the volatility of the trust, which suggests that the trust finances are adequately arranged so that trust distributions are not adversely affected. Results for the goodwill ratio and cash constraint proxy, the two variables that indicate whether the trusts are hastily conceived, show no positive effect on the return volatility in the sample of income

trusts. It does seem that the companies choosing to convert to trusts manage the restructuring well.

The parent ownership variable reflects the fact that original parent companies use the trust structure to raise capital but retain a subordinated non-controlling interest in the underlying firm or partnership. This can stabilize distributions if the original parent receives payment only after all unitholders have received their distributions at the target payout ratio. In all multiple regression analyses, the fraction of the subordinated parent ownership has no significant effect on the volatility of the trust returns. The coefficient in Table 4.3 is also positive, which mimics the results in the literature for pure corporate forms, where insider ownership levels relate positively with growth. In mature firms that are suitable to convert to the trust structure, Anderson and Reeb (2003) find that owners are less able to contribute positively, which may explain the insignificant magnitude of this effect. In their simultaneous regression study, Jensen et al. (1992) actually suggest that causality may run opposite to a signaling prediction and insiders retain ownership when prospects for growth are good. Based on a brief review of financial reports, subordinated payments are generally found to be equal to the amounts distributed to the unitholders. Thus all observations support the conclusion that the subordinated structure is not directly responsible for a reduction of risk during the period of study.

By removing the insignificant contributions in a stepwise manner, the best model that includes tenure is Model III, presented in the third column in Table 4.3. Significant

variables have coefficients that are robust, retaining their magnitude and significance levels across the various models tested. Volatility is positively related to the relative level of liability of the trust. This result is expected, since leverage increases the volatility of most firms by reducing the distance to default. The collected literature on the 'leverage effect' weakly supports this assertion from a time series perspective. As noted above, the liability to asset ratio also has a direct impact on the REIT classification. Since REITs tend to have high leverage, there is an increase in volatility that counteracts the reduction in volatility associated with REIT indicator variable, moving the relative risk of this trust type closer to oil and gas royalty trusts.[54] The liability effect also provides an explanation for the higher variance in the REIT residuals of Model I, prior to inclusion of further explanatory variables. The heteroskedasticity has been largely resolved. Since business trusts are the basis of comparison, with the highest volatility in all classes[55], an above average liability burden chosen by a business trust will lead to still higher volatility of the unit returns. Thus the liability to total asset ratio is an important indicator of risk for income trusts, as it is with most firms.

The target distribution factor is included to capture the marketing effect of offering units at $10 (CAD) and targeting an annual payout just over $1.00. This is an indicator variable that takes the value of unity, if the target payout lies in the range of ten to

[54] Since the average liability to total assets level for REITs is 0.57, the net reduction in volatility for the REIT class average is -0.117(1)+0.136(0.57) = -0.039, which is comparable to the average oil & gas royalty trust, where the net effect is -0.067(1)+0.136(0.17) = -0.044.

[55] This is seen from the negative coefficients on all of the other classification indicator variables, though the confidence interval comparison could not conclude a difference due to the dispersion in the REIT results.

thirteen percent for units sold initially at ten dollars Canadian, and takes value of zero otherwise. The target distribution level primarily pertains to the business trust classification, accounting for seventy-nine percent of the cases in which a target payout was chosen. The variable provides a proxy to respond to the criticism of the aggressive marketing of income trusts, but it could equally qualify as a liquidity proxy. The indicated units are both affordable and easy to value if the distributions are stable. The target distribution is found to significantly reduce volatility. Thus an easily understood and relatively high return on investment provides reduced risk, due to either a liquidity effect, investor behavior based on security beliefs or firms being managed well enough to meet the payout commitment. There is no indication that aggressive marketing based on a target payout has increased the risk of the security.

Payout ratio has a particular connotation for income trusts. For this study, the ratio is the amount of the declared annual distribution in the first year of the trust's operation divided by the 'distributable cash' calculated and reported for that same year. Although the construction of this independent variable relies on historical information relating to behavior at inception, the median tenure of this sample of trusts is only 3.1 years, so the ratio remains close to defining the payout in the year before volatility estimation. When the payout ratio is consistent with management policy, often reported in the annual report, the estimate will be more accurate. The payout ratio is found to have a significant positive effect on the volatility of the income trust returns. As declared distributions consume a greater amount of the distributable cash generated, the trusts demonstrate more investment risk. This drawback to the income trust structure is

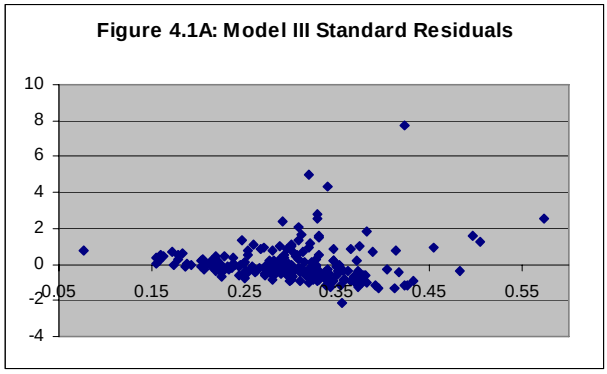
highlighted by Mintz and Richardson (2006), who believe that the requirement to pay out essentially all cash flow to investors hinders good investment decisions. A moderate amount of reinvestment seems necessary to improve the security of income trust investments.

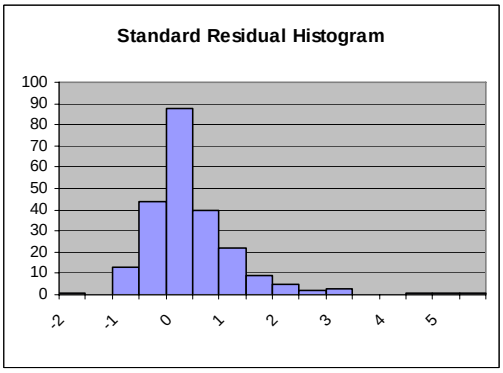
Tenure or age since inception of the trust is the final significant variable in Model III. The tenure of the firm reduces the volatility of returns. This does affect other coefficients in the model since oil & gas trusts are also the oldest trust type on average, followed sequentially by REITs, utility trusts, and business trusts. In general, the longevity of a trust's existence provides more stability to returns, which is consistent with the extant literature on firm and investor learning patterns relative to age. As payout patterns repeat and growth opportunities diminish over time, a more stable valuation of the firm is possible. The linear effect of the tenure partially corresponds to the relation between volatility with recently formed trusts, however, and this concern must be addressed further.

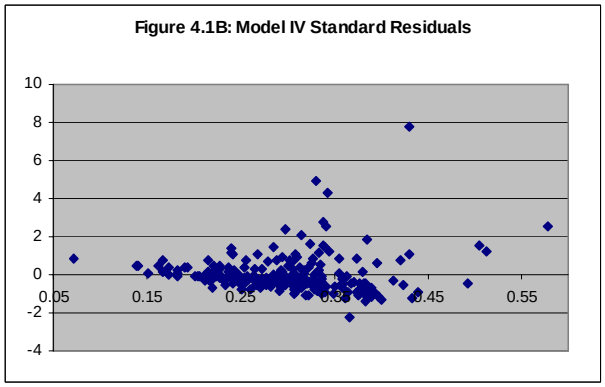
To investigate the risk associated with the rapid proliferation of income trusts in recent years, tenure is replaced in the regression by indicator variables that correspond to the most recent four years relative to the period of the study. In this short time, 183 of the 240 trusts have been formed. In Table 4.3, the fourth column includes Model IV, the results of the regression based on equation (10) above. When tenure is replaced by the yearly indicators, significant increases in volatility appear in years 2005 and 2004, with 2002 just beyond the 10% significance criteria. The effect decreases as we move back

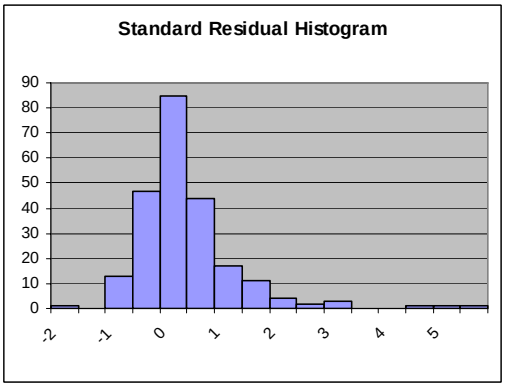
in time. Model IV explains slightly more variance than model III and it provides a similar standardized residual plot, shown in Figure 4.1. Fitting tenure in the regression

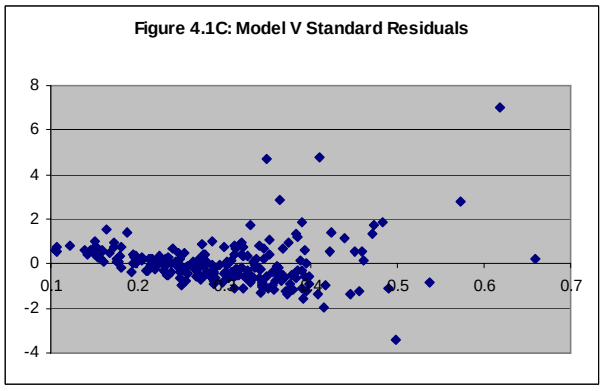
## Figure 4.1: Residual Plots for Volatility Models

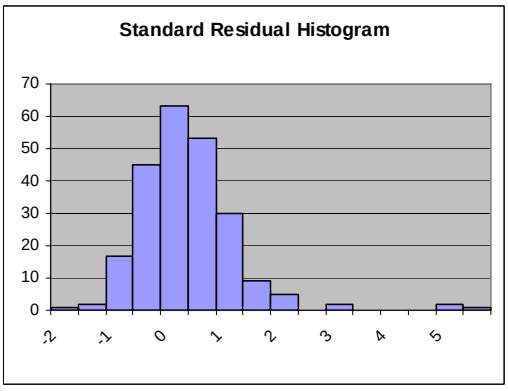


provides the constant linear estimate of a 0.69% increase in volatility per year, as shown in model III, Table 4.4. Interpolation between the recent year coefficients indicates that volatility actually rises at a steeper rate of 0.9% in the final year and at a flatter rate of 0.64% over the previous two years.[56] Also, the two outliers considered atypical in the income trust sector enter the market in 2005.[57] The most recent years successfully account for the total effect assigned to tenure in the earlier regression, with trusts introduced in the final year being the most volatile.

In the final four years, 2003 has an abnormally low coefficient with respect to the volatility of returns and twenty-three percent fewer trusts are introduced in that year. Several of the high volatility, high influence points remaining in the dataset and evidenced in the residual plots presented in Figure 4.1, are introduced in the other three years. This illustrates the concern that when a hot market for trusts is established, the quality of the offerings may be reduced. Although the finding of model IV is interesting in some historical sense, it does not lend itself well to prediction as we cannot forecast that a future strong market for trusts will occur again. However, it does corroborate the suppositions of Zetzsche (2005), who asserts that there is some instability in these securities. Even in more rational explanations of the boom and bust cycles of IPO's as described by Ritter (1984a), Persons and Warther (1997), and Lowry and Schwert (2002), opportunistic behaviour can emerge when ample funding is available in the market. Huson and Pazzaglia (2006a) do find evidence of market

[56] For 2004-2005, 0.0735 - 0.0645= 0.0090 and for 2002-2004, ½ (0.0645-0.0517) = 0.0064.
[57] For completeness, these points are reintroduced and fit to equation (4) and the coefficients for recent years increased further. However their severe influence reduces the explanatory power of the model greatly. Since their exclusion is well justified, these results are not presented here.

timing in the trust sector. As the sample of firms converting to a trust structure gets larger, less suitable firms will begin to appear. It seems that income trusts are not immune to the same demand side forces that influence volatility in other investments.

The final model tested with volatility as the response variable includes the firm size as a factor, corresponding to equation (11). The size of the income trust is defined here as the natural logarithm of the trust's market value. The regression estimates are introduced as Model V in Table 4.4, and Model III has been reproduced for direct comparison. As multicollinearity prevents the full list of variables from being tested together, a comparison between the size and tenure effects is appropriate. Model V provides the best explanation of the variance associated with income trust volatilities. Although this variable improves the ability to explain volatility, size is highly correlated with two variables of primary interest in the current study: 1) the oil and gas indicator variable and 2) tenure.[58] Oil and gas trusts are older and generally larger than the other income trusts included in the study; their market values during the period of this study have also been greatly increased by the world commodity shortage and political unrest resulting in abnormally high[59] world energy prices. This clouds the information effect corresponding to size as the magnitude of the firm cannot be easily disentangled from the stable nature of oil and gas production where proven reserves are supporting the trust distributions. A portion of this information has been retained, however, since size switches significance back to the royalty indicator, a reversal of the

[58] As explained above, tenure is also correlated to the recent year indicator variables, which necessitates consideration of three separate models.
[59] Higher than the historical prices would tend to predict.

## Table 4.4: Comparison of Tenure and Size Effects on Volatility

The sample includes 230 income trusts traded on the Toronto Stock Exchange over the period from February 24, 2004 to February 24, 2006. These firms have not been involved in merger activity and therefore, independent variables taken from the first annual report are deemed to adequately represent the state of the company. The dependent variable is the two–year historical volatility estimate of the unit returns and it is fit to the linear models using ordinary least squares (OLS). Utility, REIT, and Oil & Gas are indicator variables that take the value unity if the income trust is in that particular line of business, and zero otherwise. Royalty is an indicator variable that takes the value unity if the income trust is structured to pay distributions as a 'top-line' expense, and zero otherwise. Goodwill/TotalAssets is the ratio of goodwill to total assets from the balance sheet of the first annual report. Liabilities/TotalAssets is the ratio of total liabilities less distributions payable to total assets from the balance sheet of the first annual report. Target is an indicator variable that takes value unity if the income trust pays a distribution between 10-13%, and zero otherwise. Payout ratio is the ratio of cash distributed to 'distributable cash' as demonstrated in the first year of operation. Tenure is the length of time that the trust has been operating, calculated as the difference between July 31, 2006 and the date of inception. In Model V, tenure is replaced with size, defined as the natural logarithm of the income trust market value. A backwards stepwise procedure is used to remove all variables at less than 10% significance to produce Models III and V. Columns three and five contain the bias-corrected percentile bootstrap intervals for the significant coefficients of Models III and V.

| **Variable** | **(III) Tenure O&G** | **Model IIIB Bootstrap 95% Intervals** | **(V) Size** | **Model VB Bootstrap 95% Intervals** |
|---|---|---|---|---|
| Utility | -0.113*** (-3.67) | {-0.161 , -0.074} | -0.092*** (-3.20) | {-0.130 , -0.063} |
| REIT | -0.117*** (-3.46) | {-0.198 , -0.047} | -0.100*** (-3.23) | {-0.169 , -0.038} |
| Oil & Gas | -0.067** (-2.23) | {-0.121 , -0.022} | | |
| Royalty | | | -0.077** (-2.26) | {-0.131 -0.028} |
| Goodwill/ Total Assets | | | -0.106** (-2.16) | {-0.240 , -0.017} |
| Liabilities/ Total Assets | 0.136*** (2.71) | {0.028 , 0.280} | 0.089* (1.96) | **{-0.001 , 0.196}** |
| Target Distribution | -0.058*** (-2.76) | {-0.107 , -0.020} | -0.061*** (-3.21) | {-0.105 , -0.022} |
| Payout Ratio | 0.100*** (3.21) | **{-0.007 , 0.198}** | 0.058** (1.98) | **{-0.050 , 0.151}** |
| Tenure | -0.0069** (-1.98) | {-0.012 , -0.003} | | |
| Size | | | -0.122*** (-7.37) | {-0.191 , -0.065} |
| Constant | 0.249*** (6.40) | | 0.586*** (9.60) | |
| F statistic (p-value) | 7.19 (9E-8) | | 13.59 (6E-16) | |
| $R^2$ | 0.1848 | | 0.3298 | |
| Adj. $R^2$ | 0.1591 | | 0.3055 | |

The values presented in the table are coefficient estimates and t-scores in brackets, below. Significance is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating the 1% level. Bold-face bootstrap intervals indicate coefficients that are found insignificant at 5% using the robust procedure.

change between Model I and Model II. Approximately one third of the oil and gas trusts are conventional oil and gas royalty trusts and the coefficient on the royalty indicator corresponds to a similar reduction in volatility as that previously assigned to the oil and gas indicator. However, this result is tempered by inclusion of the business trusts that make up the other half of the royalty sample. We again see the benefit of the royalty structure that provides a 'top-line' source for distributions to unitholders: volatility is reduced.

The time dimension is extremely important to this study. The longer that an income trust exists, the larger it becomes as it acquires assets to maintain a solid means of generating income. This has been historically true for REITs and more recently, the oil and gas sector is amalgamating. In fact several trusts were removed from the study since these were recent mergers of existing trusts and therefore volatility could not be successfully traced back to the original firm attributes. The confounding of income trust size with the time dimension does not allow for resolution of the time trends described above. Any attempt to include the indicator variables for recent years results in a much poorer regression result and correlation problems with the REIT and utility indicator variables as well as the original oil and gas indicator problem. Thus Model V represents the best regression result for explaining changes in volatility, but due to the influence of trust size on other variables of interest, this regression result cannot easily be developed further.

In Model V, the effect of goodwill is also found to be significantly negative. The reduced residual error estimate has uncovered a subtle effect in the income trust sector. Goodwill is an accounting measure that balances the offset between the market value of assets and the assessed book value. The regression result suggests that this measure can act as a market valuation or reputation proxy that actually leads to a lower volatility of returns. Income trusts that are considered to have a known value above the book value of the assets exhibit lower risk in the market. This is not the case in the equities market, where market-to-book was introduced by Fama and French (1995) and has become an accepted factor increasing risk. The only reasonable explanation is that the significantly higher valuation in the market derives from the contribution of a relatively low risk tax benefit. In that case, greater valuation would correspond to more stable cash flows.

The strong performance when size is included is neither surprising nor unique to income trust securities. Decreased size is often associated with information asymmetry (Banz (1981) and Merton (1987)) and remains an important risk factor as established by Fama and French (1995). As found in Chapter 2, the confounding of size with other variables is problematic in addressing its influence in connection with these other factors that may have lesser but important influences. Aside from robust techniques such as principle components analysis, little can be done to improve the situation. Unfortunately, the method of Fama and MacBeth (1973) does not lend itself well to consideration of a large selection of independent variables with a limited sample as carried out here.

Model V also illustrates the familiar relationship between size and leverage which is indicated by a reduced coefficient estimate for the ratio of liabilities to total assets. As the income trusts increase in size, higher leverage ratios can be sustained without adversely affecting volatility of the returns. Income trusts do have specific characteristics which differentiate them from other equity securities but this study has found that volatility in returns is highly influenced by factors common to the rest of the equity market. This finding supports the result of Cleary and McKinnon (2005) that income trusts are less like fixed income securities and more like their equity counterparts.

Although the volatility of stock returns is an acceptable and available proxy for risk, it does suffer from properties that do not suit linear regression analysis. As a dependent variable, the volatility cannot be zero and is expected to follow an asymmetric right-skewed distribution. Residual analyses also indicate right-skewed distributions of the error estimates from the regressions described above, as depicted in Figure 4.1. For these reasons, we carry out several robustness tests as described in the following paragraphs to verify the reported regression results with respect to possible improved modeling techniques. There are no substantial changes to the results reported above.

The first robustness checks involve transformation of the response to induce normality in the error structure. For variables that cannot be negative and that illustrate a positive skewness, the logarithmic transformation is often recommended, and in a recent time

series study, Wright (1999) reports improvement in his volatility results when this technique is used. Replacing the response variable with the natural logarithm of the return volatility (log(vol)) produces the models presented in Table 4.5. These results are comparable in most aspects to those presented in Table 4.3. The trust structure and classification coefficient estimates seem more stable with log(vol) as the response variable, since the royalty indicator variable retains significance over the oil and gas indicator across all models of Table 4.5. The target distribution does not become significant in the log(vol) models, however, until the residual error is sufficiently reduced by inclusion of size in Model VL, in the final column. At this point, the volatility reduction effect of the goodwill ratio also becomes significant as in Model V in Table 4.3. The transformation has provided more parsimonious results with consistent estimates across the models.

The logarithmic transformation has increased the significance of the Models IL and tenure models (IIL & IIIL) when compared to Models I, II, and III, but it has reduced the significance of the size model (VL), when compared to Model V. The coefficient estimate for size is much smaller in a relative sense in this model and significance is also reduced. This is due to the fact that size is already a logarithmically transformed measure of market value and this relationship has now been altered with respect to the transformed response variable. In Table 4.4, we see the market value has a lower direct relationship than the transformed variable size based on the correlation coefficients presented. Therefore size provides a lower explanatory effect for log(vol) and yet the coefficients are more stable between Model IIL and VL in Table 4.5.

## Table 4.5: Regression Results for Response = Log(Volatility)

The sample includes 230 income trusts traded on the Toronto Stock Exchange over the period from February 24, 2004 to February 24, 2006. The firms have not been involved in merger activity and thus independent variables taken from the first annual report are deemed to adequately represent the state of the company. The dependent variable is the natural logarithm of the two–year historical volatility estimate of the unit returns and it is fit to the linear models using ordinary least squares (OLS). Utility, REIT, and Oil & Gas are indicator variables that take the value unity if the income trust is in that particular line of business, and zero otherwise. Royalty is an indicator variable that takes the value unity if the income trust is structured to pay distributions as a 'top-line' expense, and zero otherwise. Goodwill/TotalAssets is the ratio of goodwill to total assets from the balance sheet of the first annual report. Liabilities/TotalAssets is the ratio of total liabilities less distributions payable to total assets from the balance sheet of the first annual report. Target is an indicator variable that takes value unity if the income trust pays a distribution from 10 to 13%, and zero otherwise. Payout ratio is the ratio of cash distributed to 'distributable cash' as demonstrated in the first year of operation. Parent Ownership is the amount of the trust held as exchangeable shares by the original firm owners. Cash Constraint is a ratio of the cash required for asset purchase at inception to the cash raised at that time. Tenure is the length of time that the trust has been operating, calculated as the difference between July 31, 2006 and the date of inception. In Model IVL, tenure is replaced with four indicator variables (2002, 2003, 2004, and 2005) that correspond to the years of inception for trusts formed in those recent years. In Model VL, tenure is replaced with size, defined as the natural logarithm of the income trust market value. A backwards stepwise procedure is used to remove all variables at less than 10% significance to produce Models IIIL, IVL, and VL.

| Variable | (IL) Trust Classes & Structure | (IIL) Complete Model† | (IIIL) Tenure O&G | (IVL) Recent Years | (VL) Size |
|---|---|---|---|---|---|
| Utility | -0.155*** | -0.156*** | -0.137*** | -0.115*** | -0.131*** |
| | (-4.74) | (-4.38) | (-4.31) | (-3.61) | (-4.23) |
| REIT | -0.131*** | -0.172*** | -0.151*** | -0.134*** | -0.154*** |
| | (-4.01) | (-4.32) | (-4.38) | (-3.85) | (-4.64) |
| Oil & Gas | -0.042 | -0.054 | | | |
| | (-1.37) | (-1.61) | | | |
| Royalty | -0.120*** | -0.086** | -0.094** | | -0.107*** |
| | (-3.13) | (-2.07) | (-2.43) | | (-2.92) |
| Goodwill/ TotalAssets | | -0.052 | | | -0.104** |
| | | (-0.89) | | | (-1.98) |
| Liabilities/ TotalAssets | | 0.124** | 0.122** | 0.136** | 0.101** |
| | | (2.30) | (2.31) | (2.58) | (2.07) |
| Target Distribution | | -0.032 | | | -0.043** |
| | | (-1.40) | | | (-2.08) |
| Payout Ratio | | 0.098*** | 0.096*** | 0.092*** | 0.056* |
| | | (2.98) | (2.98) | (2.83) | (1.78) |
| Parent Ownership | | -0.003 | | | |
| | | (-0.05) | | | |
| Cash Constraint | | -0.006 | | | |
| | | (-0.41) | | | |
| Tenure | | -0.007* | -0.007* | | |
| | | (-1.89) | (-1.96) | | |
| 2002 | | | | 0.069** | |
| | | | | (2.14) | |
| 2003 | | | | 0.041 | |
| | | | | (1.21) | |
| 2004 | | | | 0.081** | |
| | | | | (2.44) | |
| 2005 | | | | 0.101*** | |
| | | | | (3.20) | |
| Size | | | | | -0.047*** |
| | | | | | (-6.11) |
| Constant | -0.508*** | -0.582*** | -0.618*** | -0.721*** | -0.303*** |
| | (-37.23) | (-12.69) | (-15.63) | (-17.39) | (-4.60) |

| | | | | | |
|---|---|---|---|---|---|
| F statistic | 9.95 | 5.97 | 10.15 | 7.26 | 13.04 |
| (p-value) | (2E-7) | (2E-8) | (6E-10) | (2E-8) | (2E-15) |
| $R^2$ | 0.1503 | 0.2314 | 0.2145 | 0.2080 | 0.3206 |
| Adjusted $R^2$ | 0.1352 | 0.1926 | 0.1933 | 0.1535 | 0.2960 |

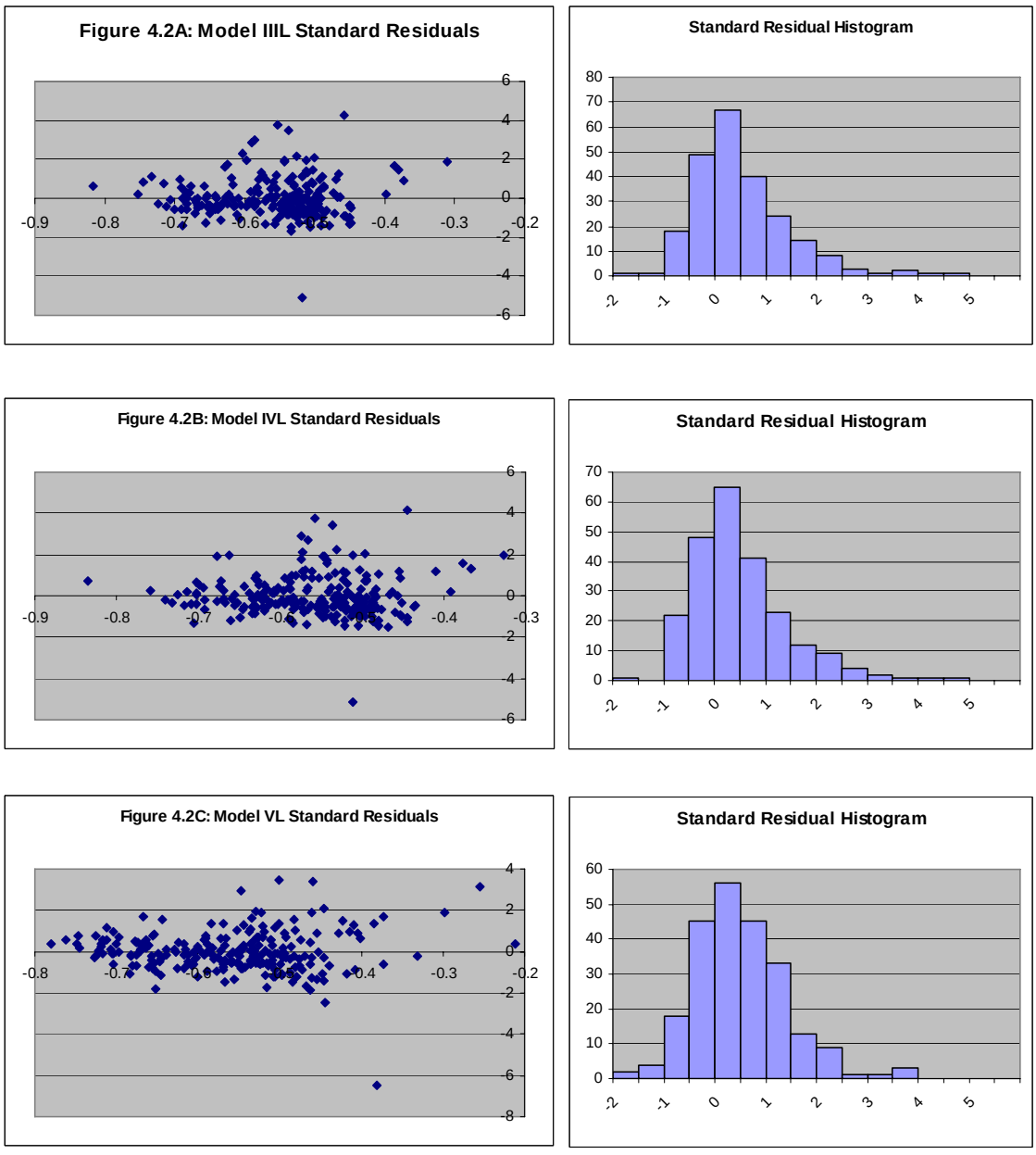
The values presented in the table are coefficient estimates and t-scores in brackets, below. Significance is indicated by the asterisks with * representing 10%, ** representing 5%, and *** indicating the 1% level.
† The complete model cannot incorporate size or IPO indicator due to multicollinearity restrictions.

The best model choice from an estimation standpoint remains Model V in Table 4.4.

The logarithmic transformation is incorporated primarily to improve the error structure of the residuals, and the final evaluation relies on the data plotted in Figure 4.2. The transformation has trimmed the upper tails of the residual distributions but has also forced an observation beyond the lower significant limits to become an outlier in all models. Removal of this point is not easily justified and has a significant effect on the regression results. The residuals remain noticeably skewed to the right, so there is questionable benefit of the transformation when the error structure is considered.

The second robustness check employs the more general Box-Cox power transformation. The logarithmic transformation is a special case of the Box-Cox transformation with exponent $\lambda=0$. In this technique, the best value of the exponent is chosen iteratively by maximum likelihood estimation but the results proved quite unstable with slight changes in the data. Similar to the logarithmic result, several residual observations are forced beyond the lower limit corresponding to reduced volatility. As above, there is insufficient information to justify removal of these data and elimination of these points greatly changes the iterative estimate of the

## Figure 4.2: Residual Plots for log(Volatility) Models




transformation exponent. This method provides no improvement in coefficient estimates, results in the additional outliers, and yields no better distribution of the

residuals.[60] As such, further investigations of power transformations of the response variable seem fruitless.

The final robust estimation method relies on distribution of the residuals to dictate the significance bounds used for inference. The right-skewed residuals, that are persistent in this study, are managed by repeated regression analysis using the bootstrap technique to form bias-corrected percentile intervals around each coefficient estimate. Five hundred repetitions with replacement are used to provide the 95% confidence intervals reported here. If the interval includes zero, then the result is considered insignificant. In other words, the parameter is likely to be zero, strictly due to chance. Bootstrap intervals are calculated for all significant coefficients estimated in equations (9), (10), and (11). The intervals for the regression that incorporates the yearly indicator variables, Model IV, are presented adjacent to its regression estimates in Table 4.3 and the intervals for the tenure and size regressions, Models III and V, are included in Table 4.4, where these models are compared to each other.

In most cases, the intervals of previously significant effects do not include zero. The effects remain significant in a numerical sense albeit at lower significance levels. The results that become insignificant at the 95% confidence level are highlighted in bold face in Tables 4.3 and 4.4. At this confidence, the payout ratio is not significant in Table 4.3, while it is considered highly significant based on least squares inference. This variable suffers from both bias and underestimation of the standard error of

[60] Removal of the outlier actually converted residuals to a quasi-left skewed result.

residuals, which results in a pronounced difference when using the bootstrap technique. In Table 4.4, payout ratio demonstrates the same result of dropping below a significance level of 5%. Thus the data do not support the highly significant result assigned to the payout ratio using least squares. At this significance level, income trusts do not increase their own volatility by paying out higher levels of distributable cash, when the error distribution is corrected to provide an unbiased result.

In Table 4.4, Model V bootstrap intervals demonstrate that the ratio of liabilities to total assets also has a coefficient estimate that is not significant at the 95% confidence level. This is consistent with the least squares result where significance is demonstrated only at 10%. Using bias-corrected bootstrap intervals from five hundred replications of the regression results we have shown numerical robustness of the results in all but one case, the payout ratio. The skewness of the residuals has now been adequately handled and has not overly influenced the significant findings.

## 4.6 Conclusion

Income trusts have been criticized as risky securities with the potential to form a pricing bubble in the Canadian securities market. This study attributes the sources of the income trusts' volatilities to publicly known characteristics of the organizations. We find royalty trusts are less volatile than investment trusts within the income trust market sector. The risk associated with the major industry classifications of trusts also indicates some order, which is better determined when other variables such as financial leverage, firm size and payout characteristics are present. It does seem possible for

investors to reduce risk by investing in the focused types of income trusts without determination of operating characteristics, but deeper review of the publicly available information improves prediction. Commensurate return is expected to be moderate: above low risk fixed-income securities but below a riskier stock portfolio.

There is no evidence that income trusts set up a poor capital structure using the proceeds of the initial public offering. The variable corresponding to cash constraint shows no significance in all models tested suggesting that appropriate levels of funds are raised. The relative level of liabilities to assets does affect the volatility of income trusts but this is expected in any firm. The need to pay primary lenders must reduce the cash available to cover the subordinated distribution payments. The liabilities taken on do seem to be set based on the business of the trust considered, however, with REITs using the most debt and oil and gas producers typically using very little. Thus the reorganization into the trust structure seems well planned from a capital structure perspective.

There is also no evidence of overpayment for the underlying assets that generate the cash for distribution. Since income trusts are often used as an exit strategy for private investors and growth firms, there is potential that the unit offering would surpass the underlying asset value. However, the constructed proxy variable, the ratio of goodwill over assets, has little effect. When it is significant in the regression equations, this variable is found to reduce volatility. This suggests that the market price of the unit

offering is appropriate and that investors recognize the proper market value of the firm to be above the book value of the underlying assets, possibly due to tax savings

Distributions do affect the volatility of the income trust. Payouts that are targeted at just over 10% annual return based on the initial unit offering price of $10 (CAD) reduce the volatility of returns of the trust. This return may be sufficient to influence the investors to buy and hold the security. If management can set and maintain a distribution at this level, then the market's expectations may be met. However, distributions must also be declared at a reasonable level below the 'distributable' cash available to the firm. The payout ratio is found to have a weak positive effect on volatility (bootstrap p=.06), but the estimate suffers from bias due to the data. Together, these results suggest that there is a level of profitability that qualifies a firm to be successful as an income trust. The distributions must satisfy the needs of the market but cannot be so great with respect to earnings that reinvestment is adversely affected.

This point bears further consideration as it lends credence to several concerns currently associated with income trusts. First, these securities have flourished in a time when interest rates have been historically low and therefore the steady return of 10% on an investment is attractive. While the Federal Reserve and the Bank of Canada can meet their inflation control objectives at the current interest rate levels, income trusts that can sustain their distributions will remain popular and the payout ratios will be manageable. However, if the market expectation for returns rises, then the income trust environment

could become more volatile and perhaps unstable. Secondly, there is a criticism that the large draw of funds out of the economy is a shortcoming of allowing the tax advantaged flow-through structure. The payout result indicates that those trusts that do not reinvest prudently in their underlying assets will become more volatile and possibly fail as a result. Thus it does seem that some certainty in the income trust segment is dependent on environmental factors that may change and some is based on the short term of the study.

Volatility has risen in recent years but increases are greater in 2002, 2004, and 2005, when greater numbers of income trusts are introduced to the market. Although REITs and oil and gas trusts have been established for a great many years, volatility increases in three of last four years are sufficient to explain the total effect that is estimated linearly by considering tenures of the income trusts in the sample. This finding supports the market timing effect of Huson and Pazzaglia (2006a) and assertions that unsuitable firms are entering this sector. Several trusts introduced into these 'hot' markets remain as outliers in the residual analysis, without pinpointing those that have specifically reduced or suspended distributions. The nature of the investments guards against an extreme loss in the event of failure but from these results, some potential for overvaluation of trust securities still exists.

Finally, the study demonstrates that focused income trusts do exhibit lower volatilities than the more general business investment classification. Over thirty percent of the variation in volatility in the trust segment can be assigned to publicly known

characteristics of the trust, most found in the annual report information. Similar to other equities, both size and leverage of the operating entity are important risk factors. Specific to this segment, the industry type, trust structure, and the size of the distribution also influence the risk of the investment. Historical volatility is unlikely to be a useful predictor of future volatility, but its use as a response variable in the current study has allowed identification of firm characteristics affecting the risk of Canadian income trusts during our period of study.

# Chapter 5

## General Discussion and Conclusion

Herein, we have investigated three types of public divestiture available to improve the structured financing of a subsidiary and a parent firm. In our first study, we differentiate between parent companies that divest through subsidiary spin-offs rather than equity carve-outs. Using a logistic regression framework, the probability of choosing the divestiture method is modeled based on public information available on the parent for an extensive number of divestitures over two full economic cycles in the 1980's and 1990's. Since the turn of the century, the income trust organizational structure has come to dominate the divestiture landscape in Canada, comprising the largest and most frequent initial public offerings in 2005 and 2006. Income trusts have been most frequently formed by the equity carve-out route, but they may also emerge from common stock conversions into trust units, similar to the pro-rata distribution of the tax-free spin-off.[61] The approach to income trusts is balanced study of risk and expected return for these securities relative to the remainder of the firms listed on the Toronto Stock Exchange. Income trusts are matched to comparable firms in our first comparison and evaluated for characteristics contributing to risk in the second analysis. These combined efforts provide a reasonable foundation to understand the motivations of corporations to divest in publicly traded offspring in general and more narrowly, in the case of income trusts.[62]

[61] In our sample of 240 income trusts, 70% were formed in an IPO, 24% were stock conversions, and 6% were conversions followed soon after with a unit offering.

[62] A good companion study for this work is the cited paper of Michaely and Shaw (1995), where the choice between tax-free spin-offs and equity carve-outs is investigated specifically for Master Limited Partnerships, "flow-through' structures quite similar to income trusts.

In Chapter two, our approach to the divestiture decision between tax-free spin-offs and equity carve-outs differs from previous efforts since aggregate carve-out data and fractional subgroups of these data are both tested against the spin-off decision. From the combined data, we find support of the hypothesis that that the parent's cash constraint motivates a carve-out rather than a spin-off, which confirms the earlier work describing the divestiture decision by Anderson (2002), Frank and Harden (2001), and Reeves (1999). In addition, the model provides strong evidence that available information leads towards the carve-out IPO, whereas potential growth opportunities favour divestiture through a spin-off, which is also reported by Michaely and Shaw (1995). From an investment perspective, the potential high return related to the purchase of shares anticipating a spin-off may stem from uncertainty in the information content regarding the parent firm, in accordance with an efficient capital market.

Results from the multinomial logistic regressions separate the carve-out data into fractions of the subsidiary offered in the IPO, to allow a clearer description among four divestiture choices. The information effect persists in the multiple logistic tests. When the firm is better known to the market, a carve-out is more likely. The effect is significant whether size or analyst following is considered in predicting a minority carve-out, and weak evidence is also found in the case of a majority carve-out. Firm size combines several different attributes that contribute to fair valuation in a public offering of equity, but we are unable to separate the various effects due to the high correlation with other independent variables.

Financial constraint is found to be a driving force in the choice towards an equity carve-out, consistent with the result of Anderson (2002). There is strong evidence of an effect related to cash flow performance in all logistic regressions and cash flow constraint becomes a more important aspect as the percentage of the subsidiary offered in the IPO rises. In majority carve-outs, the indicators of severe cash constraint become significant; cash flow level, change in cash flow, and total debt ratio all demonstrate significant effects. The impact of the debt ratio aligns with the work of Pagano et al (1998), who find investment precedes divestiture, and Allen and McConnell (1998), who assert that severe influence is required before divestitures relinquishing control will be undertaken. Thus our findings of greater cash concerns with majority carve-outs rest well with previous work.

Only in the situation of a minority carve-out are there significant effects from relatedness of the subsidiary and parent, and relative size of the subsidiary. A parent is more likely to carve-out a minority stake of a large, related subsidiary, thus retaining control. Although Anderson (2002) finds spin-offs more likely when the parent and subsidiary occupy different sectors, we find relatedness of parents and subsidiaries does not influence the divestiture decision for intermediate and majority carve-outs. Splitting the carve-out sample clarifies prior uncertainty in the literature. When the subsidiary is large compared to the parent firm, it is more likely that a minority carve-out will be undertaken, due either to constraint in the internal market or consideration of demand in the external market. Although two-stage divestitures are beyond the scope of the current study, the use of a minority carve-out as an intermediate step in

such transactions has increased over time (Thompson and Apilado (2006), Vijh (1999)). Thus Shleifer and Vishny's (1992) inverse relationship between size and liquidity has become an important consideration in divestiture. Using a minority carve-out, cash burden is eased, subsidiary value is maintained, and large related subsidiaries are sheltered beneath the parent's wing.

In Chapter three, the risk of income trusts is evaluated based on historical return volatilities over a two year period, before their inclusion in the TSX composite index and the announcement of legislative taxation changes on October 31, 2006. The trusts are found to be less volatile than a comparable group of firms trading as stocks. Within the income trust market sector, those structured as royalty trusts are less volatile than investment trusts. Some reduction in risk is also indicated by income trusts focusing within the major industry classifications. It may be possible for investors to reduce risk by investing in certain types of income trusts, primarily in the utility and oil and gas sectors. We find that earned return for such a strategy is not extraordinary; it is expected to be above that received from low risk fixed-income securities, as indicated by the positive non-normal portfolio performance measures, and below that returned by a riskier stock portfolio.

At this point, we do not find substantially greater risk shown by unsuitable candidates that have reorganized in the recent proliferation of income trusts under the general business classification. As illustrated by the performance measures and spanning tests, the valuation of income trusts in the market corresponds well to a similar set of

securities and to the composite sub-indexes. In this respect, a pricing bubble related solely to the trust sector is unlikely, even though there has been a strong market demand. A more risk-averse clientele in the market may consider the potential for moderate returns at lower volatilities as an attractive investment alternative. Specific to the income trust market segment, we find that the industry type, trust structure, and the size of the distribution influence the risk of the investment, but the return provided by any such investment strategy using income trusts could be replicated at similar risk by a suitable combination of the TSX sub-indices.

The amount of variation and the skewed distribution of the volatility estimates are further analyzed in Chapter four, where publicly available characteristics of income trusts are incorporated to explain the risk of these investments. We again find royalty trusts are less volatile than investment trusts within the income trust market sector. The risk associated with the major industry classifications indicates some order, which is better determined when variables such as financial leverage, firm size and payout characteristics are present. Almost one third of the variation in risk can be explained by the regression model, which has been robustly tested to account for the non-normality of the volatility estimates.

In response to concerns of pricing bubbles and overvaluation, there is no evidence that income trusts set up a poor capital structure using the proceeds of the initial public offering. The relative level of liabilities to assets does affect the volatility of income trusts but this is expected in any firm. The need to pay primary lenders must reduce the

cash available to cover the subordinated distribution payments, but liabilities seem to be set based on the business of the trust considered. REITs use the most debt and oil and gas producers typically use very little. Thus the reorganization into the trust structure seems well planned from a structured financing perspective. There is also no evidence of overpayment for the underlying assets that generate the cash for distribution, which might occur if the income trust is used as an exit strategy for the private investor or firm. The constructed proxy variable, the ratio of goodwill over assets, has little effect on security risk. When significant in the regression equations, this variable is found to reduce volatility, which suggests that the market price of the unit offering is appropriate and that investors correctly recognize the proper market value of the firm to be above book value, possibly due to tax savings

Distributions do affect the volatility of the income trust. Payouts that are targeted at just over 10% annual return based on the initial unit offering price of $10 (CAD) reduce the volatility of returns of the trust. This return may be sufficient to influence most investors to buy and hold the security and to stabilize trading near the unit's fundamental market price. However, distributions must also be declared at a reasonable level below the 'distributable' cash available to the firm. The payout ratio is found to have a weak positive effect on volatility, suggesting that a minimum level of profitability qualifies a firm to be successful as an income trust. The distributions must satisfy the needs of the market but cannot be so great with respect to earnings that reinvestment is adversely affected.

Volatility in the sector has risen in recent years, but increases are greater in 2002, 2004, and 2005, with greater numbers of income trusts introduced to the market. Although REITs and oil and gas trusts have been established for a great many years, volatility increases in three of last four years were sufficient to explain the total effect that was estimated linearly by considering full income trust tenure. This finding supports the assertions of market timing and unsuitable entrants to the sector. Trusts introduced into these 'hot' markets remain as outliers in our residual analysis, without identifying those that have specifically reduced or suspended distributions. Though the regular payouts guard against an extreme loss due to failure, some risk of bankruptcy and potential for overvaluation of trust securities still exists.

The manuscripts collected here describe divestiture decisions relative to the Canadian securities market and uncover the lower risk characteristics of income trusts in a period when investors did seek yield. In such a landscape, the popularity of income trusts would be predicted, as Jensen (1989) once predicted that leveraged buy-outs would replace the existing corporate form, where capital lock-in ensures prudent investment. Although formally connecting the general divestiture decision of Chapter two with the specialized structure of income trusts remains a subject for future work, the implications of our findings suggest that large, mature, well-known corporations might choose to reorganize primarily through initial public offerings into income trusts: a situation evident in the market during the period studied.

Income trusts have become popular with investors and larger trusts are still being recommended as investment vehicles[63] despite the pending legislation on the taxation of the income trust corporate form in 2011, announced on October 31, 2006. The income trusts have dropped in value, however, as expected by the discounted cash flow valuation of their reduced after-tax payouts in future years. As a result, a number have been purchased by private equity consortiums, known to make use of the debt tax shields associated with sizable leverage positions. As we approach the legislated taxation deadline, it remains to be seen if the income trust structure will survive or become a redundant layer of the organization. Future work may identify whether there is a reasonable place for less volatile, 'flow-through' securities in developed capital markets. If they can survive, the pricing of these securities is expected to be commensurate with the amount of risk associated with the underlying operations in accordance with an efficient capital market. This empirical research identifies several publicly available factors to assess that level of risk, allowing investors to value the resulting securities accordingly.

[63] "Once-wary broker gives Yellow Pages stamp of approval" *The Globe & Mail* (July 12, 2007).

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