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Factors affecting the underpricing of junior mining initial public offerings in a "hot issue" market

Jason Scott McPherson
Student No: 10673084

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Abstract

The pricing of Initial Public Offerings (IPOs) is an area of interest to practitioners and academics alike given the empirical regularity of investors in IPOs making very large first day returns. These first day returns are as a result of share underpricing.

Academics have explained the underpricing phenomenon in terms of *ex ante* uncertainty, namely the risk of pricing, off take and issuing of such shares. In an attempt to predict the degree of the phenomenon much work has been done in linking underpricing to company, issue and market related factors that are known prior to the listing (*ex ante* as opposed to *ex post* information).

In the case of junior mining companies, underpricing is exacerbated by a lack of financial information making these issues difficult to value since such unseasoned companies have no past earnings history on which to base predictions of future earnings.

Given this context, this study identified relevant factors from secondary sources which could be used to proxy the level of *ex ante* uncertainty and therefore correlate with the degree of underpricing. The analysis firstly sought to ensure that underpricing exists for the issues, market and time period of interest. Secondly the presence of a "hot issue" period (Ritter, 1984), which is exclusive to the natural resources sector, was investigated. Finally the relationship between underpricing and the relevant factors was explored using hypothesis testing about means and regression analysis.

It was found that underpricing does indeed exist for junior mining listings on the Toronto Venture Exchange (TSX-V) between 2005-2007. This said no evidence of the "hot issue" period could be found. In terms of linking company, issue and market related factors to the degree of underpricing this study failed to identify any significant predictors.

It is argued that junior mining listings on the TSX-V may be a special case since some of these factors have successfully been used, by other researchers, to predict the degree of underpricing of mining IPOs. The fact that junior mining IPO's listed on the TSX-V show a constant degree of underpricing over time implies that investors do not build market specific factors (market sentiment and commodity price) into the listing price. Rather investors seem to demand a constant degree of underpricing regardless of the market situation to compensate them for the "unknown" exploration risk.

Keywords: underpricing, initial public offerings (IPO), junior mining companies

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Masters of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Jason Scott McPherson Date

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1. INTRODUCTION TO THE RESEARCH PROBLEM

1.1. Research Title

Factors affecting the underpricing of junior mining initial public offerings in a "hot issue" market.

1.2. Underpricing

The principle investigated is that of underpricing which is present in Initial Public Offerings (IPOs). Initial public offerings, and the pricing issues that surround this means of going public, are an active area of finance research given the first day returns made by investors. Determining the 'optimum' selling (or issue) price for these shares is difficult in that if the issue price is set too high an under-subscription may occur whereby the company will not have raised the amount of capital needed and as a result may decline to list on the stock exchange. Conversely if the issue price is too low then an over-subscription may occur in that the issuing company will have sold its shares "cheaply" and lost out on cash that they could have obtained for shares (Dimovski, 2006).

Underpricing is common and has been well documented in different markets. For instance on the US stock exchanges over the period of 1990 to 2010 the mean, proceeds weighted, average first day underpricing was 20.4% (Ritter, 2011). Other values reported in academic literature range from 5.4% in Denmark to 267% for subscribers of Chinese 'A' class shares (Dimovski, 2006). Lawson & Ward (1998) reported that underpricing on the Johannesburg Stock Exchange (JSE) dropped from 32.1% (1973 – 1986) to 27.2% (1986 – 1995). While on the Canadian stock exchanges a value of 18.95% (1997 – 1999) was reported by Kooli & Suret (2004).

More recently the LinkedIn IPO (19 May 2011) on the New York Stock Exchange drew heavy criticism of the underwriters (Morgan Stanley and Bank of America's Merrill Lynch division) due to the high degree of underpricing - approximately 110% (Nocera, 2011).

1.3. Research Problem and Purpose

At the heart of underpricing is the issue of *ex ante* uncertainty, namely the risk of pricing, off take and issuing of such shares (due to incomplete information between the relevant parties) before the IPO event. Researchers have therefore sought to explain an increase in underpricing by examining financial and non-financial factors that measure an increase in *ex ante* uncertainty (Engelen & van Essen, 2010; How, 2001; Ritter, 1984). The correlation of these financial and non-financial factors with underpricing has met with some success (Adjasi, Osei, & Fiawoyife, 2011; Dimovski & Brooks, 2004; Dimovski & Brooks, 2008; How, 2001).

In terms of underpricing the natural resources sector is unique in that Ritter (1984), in examining the U.S. market during the 1980's, identified a distinct "industry effect". That is, IPOs issued by firms in the natural resources sector are more underpriced than those issued by firms in other sectors (56.2% vs. 17.3%) during a period which coincides with a commodity price boom (Ritter, 1984). Accordingly this period is referred to as a "hot issue" market due to the excess returns achieved.

In the case of junior mining companies, as a subset of the natural resources sector, underpricing is also exacerbated by a lack of financial information making these issues difficult to value since unseasoned companies often have no past earnings history on which to base predictions of future earnings (Smithson & Firer, 2007). Average underpricing reported for junior mining companies in a period "hot issue" include:

- 46% - JSE (Page Reyneke, 1997)
- 35.71% - Canadian Stock Exchanges (Kooli & Suret, 2004)
- 63.6% - 107.18% - Australian Stock Exchange (ASX) (How, 2001)

In all cases these researchers conclude that the average degree of underpricing of these junior mining companies is significantly higher than that documented for other industrial firms / sectors.

Despite the revelation of such excessive underpricing of junior mining IPOs limited research has been conducted in this area. Analysis of work by authors studying the underpricing of Australian junior mining company floats, show that typical factors that describe *ex ante* uncertainty (and hence correlate to the degree of underpricing) of companies operating in other sectors do not apply in this context - these include:

- Factors representing the 'reputation' of advisors (Dimovski & Brooks, 2004, 2008; How, 2001)
- Factors representing *ex ante* uncertainty - company size, age, growth potential (How, 2001)

Given the low correlation coefficients obtained by regression techniques, the factors that drive underpricing in the listing of junior mining companies are thought to be very different compared to companies in other industries. This is an area that will be explored by trying to correlate underpricing with non-financial factors proposed by Cranstoun (2010), Smithson (2006), Dimovski & Brooks (2004), and How (2001), as well as "novel" factors.

These "novel" factors have been selected based on a descriptive study of Australian junior exploration floats (Kreuzer, Etheridge, & Guj, 2007). It therefore seems relevant

to add these factors to a regression model in order to more accurately predict the degree of underpricing of junior mining IPOs.

1.4. Context

Originally it was proposed to focus on junior platinum mining IPOs listing on the Toronto Venture Exchange (TSX-V) between 2002 and 2007. This is because junior platinum mining companies are a special sub-set of mining IPOs with relevance to South Africa. It was subsequently found that not enough listings involving platinum exploration / mining were conducted in the period of interest; hence the scope was altered to include all junior mining initial public offerings listed on the TSX-V.

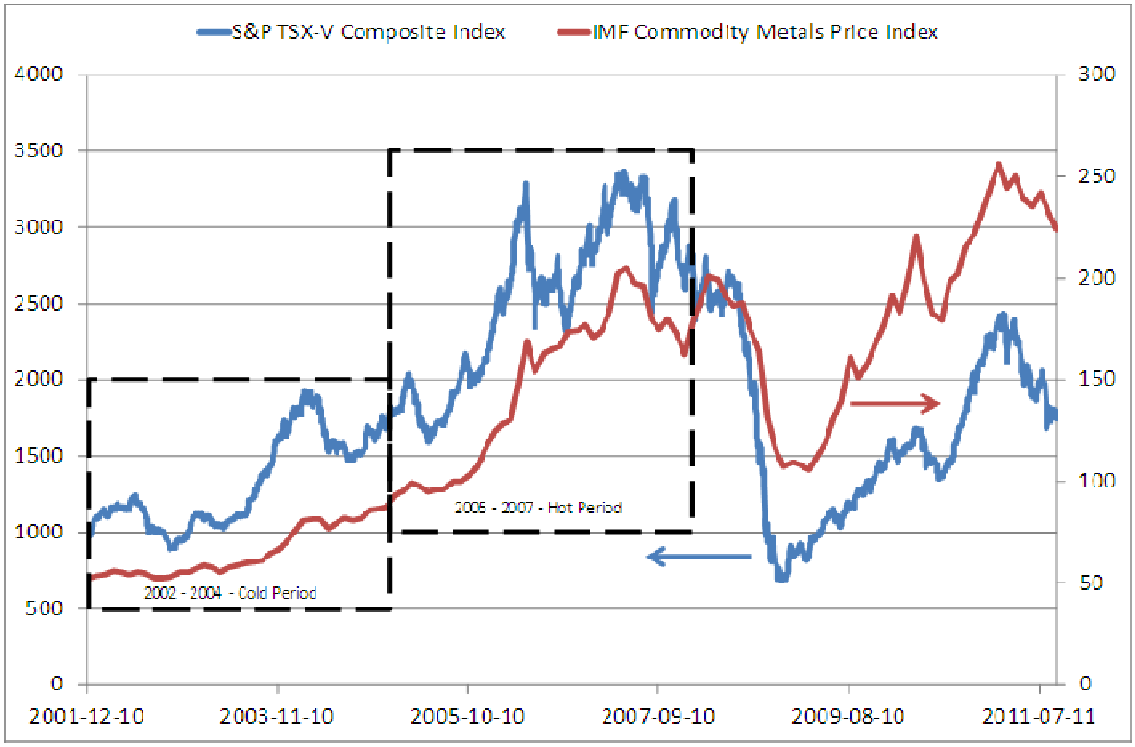

Figure 1: Metals Price and TSX-V Indexes over Period of Interest

In terms of linking factors to underpricing - the period of interest was curtailed in that Smithson (2006) found no evidence for a "hot issue" pre-2004. Accordingly it seems pertinent to investigate the period of 2005 to 2007 based on the dramatic increase in the

commodities metals prices (as reflected by the increase in the International Monetary Fund Commodity Metals Price Index) and the Standard & Poor's (S&P) TSX-V Composite Index during this time. In other words the indicators for a "hot issue" market are present during the 2005 to 2007 period (Figure 1).

Toronto is considered to be one of the world's most important mining finance centres (Smithson & Firer, 2007). The Toronto Stock Exchange (TSX) has a junior market where smaller, more risky companies are encouraged to list. The Toronto Venture Exchange (TSX-V) had by 2010 attracted 1,178 new listings of the so called "junior mining stocks" thereby raising substantial funds for these ventures (TSX Inc., 2011).

1.5. Research Motivation

This research therefore seeks to improve on the work of Cranstoun (2010); Dimovski & Brooks (2008); Nguyen, Dimovski & Brooks (2007), and How (2001) in identifying factors which affect the underpricing of junior mining initial public offerings. In particular factors such as company experience (as highlighted but not incorporated by Cranstoun, 2010 and Rudenno, 1998) and the stage of business development (as highlighted but not incorporated by How, 2001 and Kreuzer *et al*, 2007) will be introduced into a regression model to explain the underpricing phenomenon.

1.6. Research Objectives

This research will be conducted in three phases in the following sequence in order to address the research aim:

1. Identify relevant factors outlined by previous work (secondary sources) used to explain the phenomenon of underpricing of IPOs. Factors suitable for natural resource IPOs, and specifically mining IPOs with a focus on junior mining IPOs, will be identified.

2. Ensure that underpricing exists for the issues, market and time period of interest and explore if a hot issue period is apparent.
3. Examine the relationship between underpricing and
    a. various relevant factors outlined by previous work.
    b. those newly identified factors.
    c. any combination thereof.
4. Suggest the inclusion or exclusion of factors that can be incorporated into the estimation of the underpricing phenomenon in order to assist investment houses in pricing junior mining company shares.

1.7. Research Aim

The aim of this research is to establish that a hot period indeed exists for junior mining listings on the TSX-V between 2005 and 2007. Furthermore the impact that non-financial factors (such as experience and stage of business development) have on the accuracy in forecasting the degree of underpricing of junior mining IPOs will be investigated.

2. THEORY AND LITERATURE REVIEW

2.1. Introduction

An Initial Public Offering (IPO) is defined as an issuing body's (private company's / firm's) first equity issue made available to the public (Ross, Westerfield, Jordan & Firer 2001). There are two principal reasons to conduct such a transaction (Rock, 1986):

1. To refinance the firm thereby allowing the current owners to diversify their portfolios and / or realising their invested wealth.
2. To obtain new funds without the need for complex covenants / restrictions.

IPOs typically involve an underwriter – a company that together with the issuer sets the list price and administers the public issuance and distribution of securities. The sale (allocation and pricing) of shares in an IPO may take several forms (Williamson, 1988. Common methods include:

- Best efforts contract - the underwriter agrees to sell as many shares as possible at the agreed-upon price.
- Firm commitment contract - the underwriter guarantees the sale of the issued stock at the agreed-upon price.
- All-or-none contract - the underwriter agrees either to sell the entire offering or to cancel the deal.
- Stand-by underwriting - the issuer contracts the underwriter to purchase the shares the issuer failed to sell under stockholders' subscription and applications.

The objective of any IPO is to achieve the highest value (raised capital) for the issuer while ensuring a buoyant start to secondary trading and long-term performance (Mokombe & Ward, 2002).

2.2. Definition of Underpricing

A share is underpriced if its offer price at the IPO is lower than the closing price on the first day of trade (Mokombe & Ward, 2002). Underpricing may however be expressed in a number of ways – the first is by subtracting the issue price (P_0) from the closing price (P_1) of the newly listed company's shares on the first day of trading on the stock exchange. Underpricing return (R_i) of stock *i* is calculated by dividing the underpricing by the issue price (Dimovski & Brooks, 2008; Dimovski, 2006).

Equation 1: Underpricing Return

$$Ri = \frac{P_1 - P_0}{P_0}$$

The second involves factoring in the return of a suitable market index (R_m) over the same time period of trading as stock *i* (Adjasi *et al.*, 2011). This is referred to as the initial abnormal market adjusted first day return (IAR_i).

Equation 2: Initial Abnormal Market Adjusted First Day Return of Stock i

$$IAR_i = R_i - R_m$$

While these definitions of underpricing (R_i vs. IAR_i) are technically different their results are similar in that the market return (R_m) over a single day is typically negligible. By way of example adjusting a data set obtained from Smithson (2006) documenting the underpricing of junior mining IPO's listed on the TSX between 2002 to 2004 resulted in the mean underpricing changing from 48.29% ($R_{2002\text{-}2004}$) to 48.22% ($IAR_{2002\text{-}2004}$) when taking the market return into account. For the remainder of this study no distinction is made between these two definitions although this study does employ the use of initial abnormal adjusted first day return (IAR_i) in its calculation of

underpricing. Furthermore the term underpricing is also synonymous with the term initial return.

The result of underpricing is manifested as "money left on the table", which may be defined as the number of issued shares multiplied by the difference between the issue price and the first day of listing closing price (Dimovski, 2006). Hence this phenomenon is typically viewed from the eyes of the issuer as opposed to the buyer. Underpricing is common as shown previously (see Introduction).

2.3. Theories Explaining the Underpricing Phenomenon

The literature describing the underpricing of IPOs is a sub-set of auction theory, although the resemblance is not exact (Rock, 1986). This is because the price of the offer is not determined by the bidding of the investor. Rather investors rely on an allocation of rationed shares from the underwriter. Furthermore the issuing firm is both a bidder and a seller. In that the firm must submit a price in consultation with the underwriter, and exchange assets for cash (Rock, 1986).

Rock (1982, 1986) proposed a model to explain underpricing in response to work performed in the 1970's in which researchers reported underpricing but concluded that the phenomenon remained a mystery (Ibbotson, 1975; Ibbotson & Jaffe 1975). Rock's (1982, 1986) model proposed that underpricing was an equilibrium condition where the phenomenon was necessary to encourage investors to participate in the IPO market.

In this model issuing firms and their underwriters are uncertain about the correct value of a share (υ). Investors are also uncertain about the correct value but at a cost an investor can learn the shares true value. This cost represents the monetary value required to obtain such information. Investors who incur this cost are termed informed investors, hence they will only submit purchase orders if the offering price (OP) is less

than the true value of a share (υ). Conversely, some investors may determine that such costs are unacceptably high but may still choose to participate in the IPO. Accordingly the dollar demand for shares in each scenario may be stated as follows:

NT+I if OP < υ

NT if OP > υ

Where: I = informed demand

N = the number of uninformed investors

T = the fraction of wealth uninformed investors wish to invest

υ = correct value of share

OP = offering price

So if the issue is overpriced (OP > υ) only uniformed investors will submit purchase orders. While if the issue is underpriced (OP < υ) both informed and uninformed investors will be allocated some of the shares. Rock's (1982, 1986) derivations show that the probability of receiving an allocation of an underpriced issue (OP < υ) is less than or equal to the probability of receiving an allocation of an overpriced issue (OP > υ) – this is known as the "winner curse" (Ritter, 1984). To negate this bias or "curse" the underwriters must price the shares at a discount to attract uninformed investors to the offering (Rock, 1986).

2.3.1. Changing Risk Composition Hypothesis

This model was expanded on by Ritter (1984), who introduced the Changing Risk Composition Hypothesis, in that Rock's (1982, 1986) model implies that riskier firms should have higher average initial returns than firms that are easier to evaluate. In observing the US market cycles of the 1980's, in which the degree of IPO underpricing

oscillates, Ritter (1984) found a statistically significant relationship between uninformed investor uncertainty regarding the true value of the share (*ex ante* risk) and the degree of underpricing (Rock, 1982, 1986).

This was achieved by classifying companies in several risk categories, and then verifying that the average initial returns were higher for firms in higher risk categories. The two risk proxies used (company sales – *ex ante* accounting information, and the daily standard deviations of returns in the aftermarket – *ex post* stock market returns) are considered by the author to be highly correlated with *ex ante* uncertainty (Ritter, 1984).

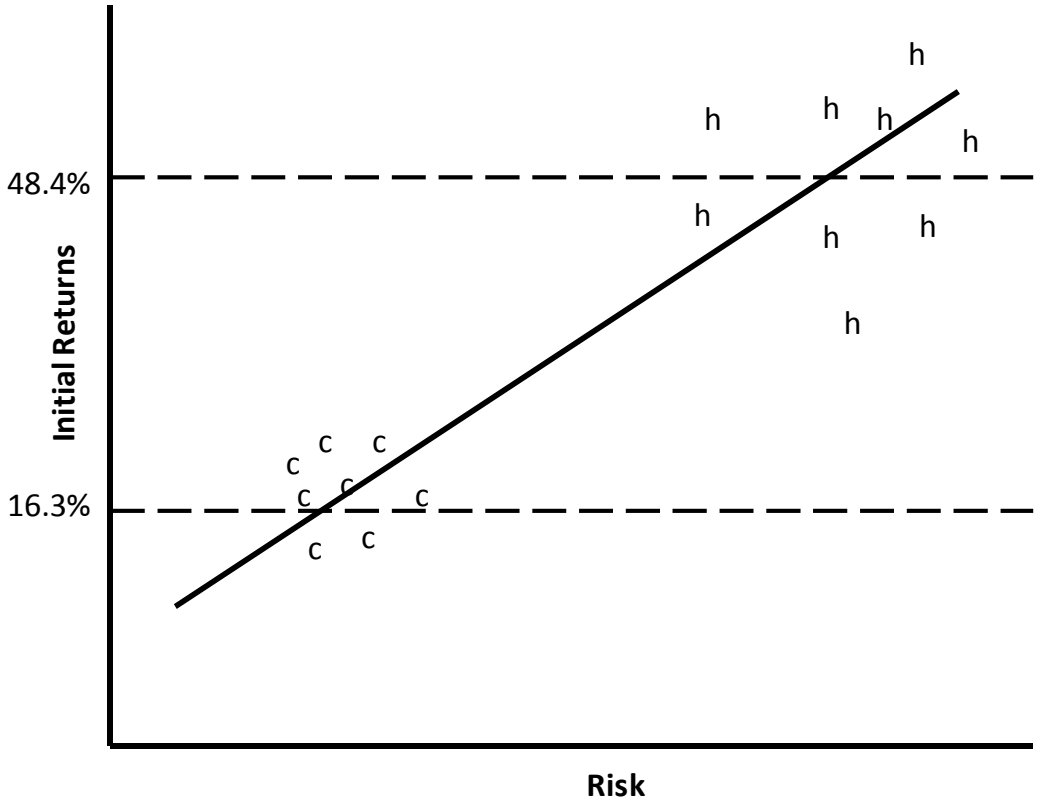

Figure 2: Changing Risk Composition Hypothesis (adapted from Ritter, 1984)

Ritter (1984) concluded in some market periods a large portion of IPO's involve high-risk firms (h) hence the high initial returns (underpricing), while in other periods more low risk firms (c) conduct IPO's with commensurately low initial returns. The changing

risk hypothesis finds that regardless of the market period all data sits on the same risk – initial return line (Figure 2).

A second testable implication of Rock's model (1982, 1986) , performed by Ritter (1984), is that that the risk - return relationship should be heteroscedastic. In statistics, a sequence of random variables is heteroscedastic, if the random variables have different variances. In this case Ritter (1984) found that higher risk categories of firms have higher initial returns (underpricing), but also a greater variation of the initial returns. In terms of Figure 2, the deviation of the c's from the risk – initial return line should be less than the h's.

The implications of Ritter's work are that initial returns (underpricing) and *ex ante* uncertainty (risk) show a positive relationship. Therefore assuming that Rock's (1986) model is correct, the degree of underpricing (initial returns) can be correlated with the degree of *ex ante* uncertainty. If such a correlation can be established then one can develop a model to predict the degree of underpricing based on *ex ante* uncertainty. The question therefore remains as to what factors should be used to determine *ex ante* uncertainty, and if such a correlation is unique to industry sector and market period.

2.3.2. Information Asymmetry Hypothesis

The information asymmetry hypothesis has also been used to explain the phenomenon of underpricing. Since the issuer of an IPO is in the market for the first time, there is an uneven distribution of information about the issuing firm's value as well as the demand for its shares among the issuing firm, investors and the investment bank handling the issue (Adjasi *et al*., 2011).

Issuing firm & underwriters - Baron (1982) suggests that underpricing is compensation for the risk of the equity offering in that underwriters do not have access to all the company information to formulate the market demand.

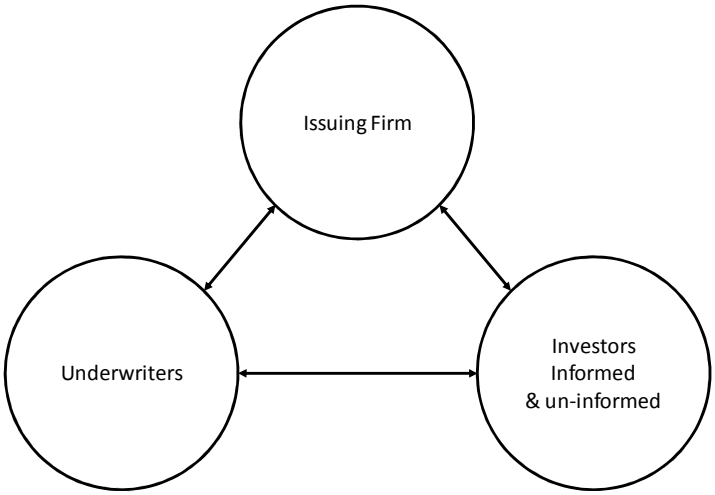

Figure 3: Parties Involved in the Information Asymmetry Hypothesis

Informed & uniformed investors – as stated previously, Rock (1986) theorised that underpricing is necessary to compensate investors for what is known as the "winner's curse". This refers to the effect in which informed investors withdraw from the market when they identify a poor issue. This means that uniformed investors risk receiving a larger allocation of poor as opposed to good issues. In order to make sure that uniformed investors purchase the issue, Rock argues that listing firms must price their shares as a discount (Rock, 1986).

Issuing firm & investors - Allen & Faulhaber (1989) and Welch (1989) detail how issuing firms have superior information and underpricing the IPO allows for subsequent share issues by the company at a higher price in order to recoup some of the underpricing.

Issuing firm + underwriter & investors - Tinic (1988) presents the case that under-pricing is an insurance policy protecting the underwriters and issuers from the risk that disgruntled subscribers may take legal action against them.

All these theories are therefore linked to *ex ante* uncertainty, in that it is difficult to quantify the risk of pricing, off take and issuing of such shares (due to incomplete information) before the IPO event.

The heart of the IPO process is that higher uncertainty leads to higher underpricing (Engelen & van Essen, 2010; How 2001;Ritter 1984). The question is therefore how *ex ante* uncertainty is quantified and measured.

2.4. Factors Used to Determine *Ex Ante* Uncertainty of IPOs

In exploring the positive relationship between underpricing and *ex ante* risk (Figure 2), Ritter (1984) used two proxies to measure the latter, namely company sales (*ex ante* accounting information), and the daily standard deviations of returns in the aftermarket (*ex post* stock market returns). The problem here is that we wish to forecast the degree of underpricing of IPOs based on *ex ante* information. Accordingly the use of *ex post* stock market information is unsuitable; furthermore not all IPOs (especially junior mining companies) have sales prior to listing. Hence researchers have sought to explain underpricing by examining company specific financial and non-financial factors in an attempt to quantify *ex ante* uncertainty (Engelen & van Essen, 2010; Dimovski & Brooks, 2008; How, 2001) – examples include:

Firm age – Is defined as the difference between a firms listing and founding dates. Many studies show that the older the firm, the lower the level of underpricing since more information is known (How, 2001; Adjasi *et al.*, 2011). Overall, older firms create

less *ex ante* uncertainty about firm value and the level of underpricing will therefore be lower (Engelen & van Essen, 2010).

Firm size – Typically defined as value of total assets – with an increase in firm size (asset value) resulting in a decrease in underpricing. This is because of an expected lower return variance of the assets already in place, and hence lower *ex ante* uncertainty (How, 2001).

Growth opportunity - Firms with a lot of growth opportunities have a higher price earnings ratio which causes more risk and uncertainty for investors about the true value of the firm. It can therefore be expected that firms with higher price earnings ratios on average have higher levels of underpricing (Engelen & van Essen, 2010). This is also confirmed by How (2001) where growth is measured as the ratio of the value of all tangible assets per share to the share price. IPOs that have lower growth return potential, in terms of assets in place, have lower *ex ante* uncertainty.

Reputation effects – Highly reputable underwriters and auditors are associated with IPO's of less *ex ante* uncertainty and underpricing (Dimovski & Brooks, 2008; How, 2001). This is explained by these advisors selecting issuing firms of low *ex ante* uncertainty in order to protect their clients, thereby protecting their reputation (Beatty & Ritter, 1985). Typical proxies used for determining an advisors reputation include:

- Capital paradigm - advisor market share, age of the advisory firm.
- Frequency of engagements – the number of times an advisor is chosen to serve the sample firms.

Based on the above it is obvious that there are many factors that may be used to measure *ex ante* uncertainty and therefore the degree of underpricing. It therefore seems

prudent to focus the literature review in order to identify pertinent factors applicable to natural resource and mining IPOs.

2.5. The Underpricing of Natural Resource IPOs

In his examination of the IPO market of the United States of America, Ritter documented that periods of "hot" and "cold" issue occur. Here a period of "hot" issue is characterised by high average initial returns which have been followed by a prolonged increase in the volume of IPOs (Figure 4).

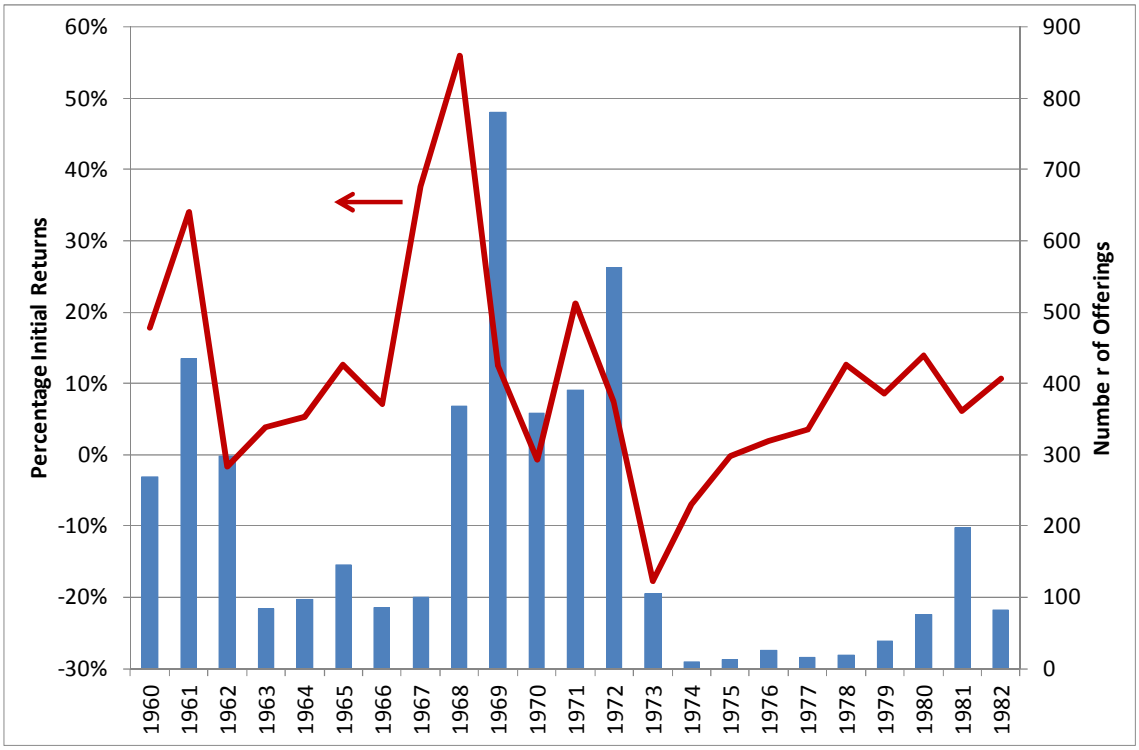

Figure 4: Average Initial Returns & Number Offerings per year (1960-1982) for SEC-Registered IPOs (adapted from Ritter, 1984)

In applying Rock's (1982, 1986) model, to explain this suspected equilibrium phenomenon, Ritter (1984) found evidence that a positive relation exists between *ex ante* risk and initial return (Figure 2). This relationship implies that a "hot" issue market

occurs if, during a given time period, a large proportion of the IPOs have high *ex ante* risk. The converse is true for a "cold" issue market.

In examining this phenomenon further, Ritter found that for non-natural resource issues the existence of a "hot" market is barely perceptible (underpricing on average = 15.8% cold, 21% hot). By contrast the natural resource issues show a clear "hot" and "cold" issue period (underpricing on average = 18.3% cold, 110.9% hot).

This "industry effect", based on the disparity in behaviour between the underpricing of natural resource and non-natural resource issues, implies that the factors that determine *ex ante* uncertainty, and the degree of underpricing, of mining IPOs may be different compared to those in other industries. Accordingly the literature review will now focus on the phenomenon of underpricing specifically for mining IPOs.

2.6. The Underpricing of Mining IPOs

Rudenno (1998, p. 98) mentions that the share price performance for resource companies is affected primarily, amongst other things, by commodity prices, exchange rates and production. This does not necessarily apply to junior mining companies, which are defined as those resource companies that have no production operations and must therefore be valued in terms of their exploration (Rudenno, 1998). Over time as more exploration is carried out, the resource base and the economics of a discovery are likely to change. Hence the first day share price movements of mining juniors cannot be tracked by factors that affect established resource companies (Rudenno, 1998).

This is further supported by Smithson & Firer (2007) who state that in the case of junior mining companies, underpricing is also exacerbated by a lack of financial information making these issues difficult to value since unseasoned companies often have no past earnings history on which to base predictions of future earnings.

2.7. Established Factors to Determine *Ex Ante* Uncertainty of Mining IPOs

In an attempt to determine non-financial *ex ante* factors which describe *ex ante* uncertainty, and therefore relate to the degree of underpricing of junior mining IPOs, researchers generally focus on the following three groups of factors:

2.7.1. Firm Specific Factors

Age, size, growth – Previously it was shown that these are typical proxies of *ex ante* uncertainty for IPOs. Firms that are older, larger and have lower growth potential should show lower *ex ante* uncertainty and therefore a lower degree of underpricing. How (2001) has shown that none of these proxies are statistically significant in explaining the underpricing of junior mining IPOs in Australia. No explanation is offered however it is thought that most junior mining IPOs by definition are young, small and have a high growth potential.

Stage – Interestingly How (2001) does imply that a more appropriate proxy of *ex ante* uncertainty for junior mining companies may be the stage of development however due to a data collection problem this researcher failed to explore this further. As discussed previously higher risk issues should show a higher degree of underpricing. In this regard many mining companies are pure exploration plays and may be considered to be relatively high risk investments compared to those with a defined resource or mine asset (Smithson, 2006). The degree of risk therefore relates to the stage of mine development which is defined by Lord, Etheridge, Willson, Hall & Uttley (2001) and shown in Figure 5. Cranstoun (2010) in his study of junior gold mining companies listing on various exchanges between 2008 – 2010 concluded that underpricing and independent variables including producing vs. non producing firms (using dummy variables) showed no statistically significant relationship.

Stage	A	B	C	D	E	F
Lord et al. (2001)	Project generation	Prospect definition	Systematic drilling	Resouce Delineation	Feasibility	Mine
Cranstoun (2010)	Non Producing					Producing
Smithson (2006)	Exploration			Defined Resource		Mine Assets

Figure 5: Stage of Development of Mining IPO as Defined by Various Authors

Smithson (2006) in his study of mining listings on the AIM between 1997-mid 2006 concluded that there is no statistical difference in the underpricing of companies that have primary exploration licenses only, vs. companies that have a defined resource (feasibility), vs. companies that have mine assets. It can be argued that since many junior mining IPOs are in the exploration phase a more appropriate proxy of stage is needed as opposed to the type of mining license or simply stating if a firm is producing or not. In other words a proxy should be used that gives more resolution with regard to the exploration phase (Figure 5).

Geologist reputation – Reputation has been dealt with previously in that highly reputable underwriters and auditors are associated with IPO's of less ex ante uncertainty and underpricing. For mining IPOs, on a variety of stock markets, a senior qualified geologist is typically required to verify the mining and exploration geology prior to listing. Accordingly the geologist can be thought of as the auditor who verifies "the opportunity" hence reputational effects come into play. This means that mining IPOs that use reputable geologists should carry less *ex ante* uncertainty and underpricing.

How (2001) found a statistically insignificant relationship between geologist reputation and underpricing of junior mining IPOs in Australia. Here geologist reputation was proxied by the frequency at which a given investigating geologist was engaged by sample firms in the offerings (How, 2001). This is in contrast to other IPOs in which reputational effects of underwriters and auditors do play a role in underpricing (Beatty & Ritter, 1985). No explanation is offered in this regard.

2.7.2. Issue Specific Factors

Underwritten – all IPOs in this study are underwritten hence this factor will not be explored except to say that there are opposing forces that can operate on this variable. Namely that the use of an underwriter may result in a higher degree of underpricing however this must be weighed against the reputation of the underwriter which may be at risk (Dimovski & Brooks, 2008).

Underwriter reputation – As discussed previously various studies of non-mining IPOs have used factors to describe the reputation of the underwriters and advisors. Studies by Dimovski & Brooks (2004, 2008) and How (2001), of Australian junior mining IPOs, have shown that the reputation of external advisors does not statistically explain the degree to which these mining IPOs are underpriced. The explanation offered is that there is little financial information that needs to be certified or audited for junior mining IPOs, therefore the importance of the investigating accountant in reducing the information asymmetry problem is reduced. Indeed the geological data presented in the prospectus (according to strict valuation rules) provides the investor with a basis for assessing the value of the new issue (How, 2001).

Underwriter domicile – Cranstoun (2010) could find no evidence that underwriter domicile had any affect on underpricing.

Underwriter options – this is typically expressed as a dummy variable (0 or 1) which captures if share options were available to the underwriter. Work by Dimovski & Brooks (2008) in analysing the underpricing of Australian gold mining juniors found that the coefficient of this variable to be negative. This implies that the presence of underwriter options decreases underpricing of an IPO. This is explained by Dunbar

(1995) in that an underwriter is more likely to "display a positive sentiment" and value the company correctly if they have a vested interest.

Delay – defined as the number of calendar days from the prospectus registration date to the listing date. A statistically significant negative coefficient for this variable was found by How (2001) in examining the initial and long run performance of Mining IPOs in Australia. This means the longer the delay in the listing the less underpricing is present. This is based on the hypothesis of information asymmetry, as detailed above, in that the longer it takes to list the more informed investors are hence there is less of a need to compensate for the "winner's curse". Similar results were reported by Nguyen *et al*. (2007) regarding resource sector IPO's.

Total capitalisation – It has been found for other IPOs that smaller issues result in higher underpricing (Beatty & Ritter, 1986). This is because smaller issues show a higher degree of *ex ante* uncertainty compared to larger issues. In terms of junior mining IPOs Smithson (2006) found that smaller mining listings on the TSX-V between 1999 and the first half of 2006 were more underpriced than those listings where large amounts of capital were raised. This effect was not seen for listings on the AIM market over the same time period (Smithson, 2006). Nguyen *et al.* (2010) also reported seeing no evidence for underpricing being related to issue size for junior mining listings between 1994 and 2005 on the ASX. Finally Dimovski & Brooks (2008) found a statistically significant negative coefficient for this variable while researching the underpricing of gold mining IPOs on the ASX. This means that the underpricing decreases with increasing issue size (capital raised) and agrees with the arguments presented by Beatty & Ritter, 1986. It can therefore be seen that two of the studies above support the theory, that smaller issues result in higher underpricing, while the other studies provide conflicting evidence.

2.7.3. Market Specific Factors

Hot or cold period – this is typically expressed as a dummy variable used to account for the affect that natural resource IPOs issued in a "hot issue" market period are significantly more underpriced than those in a cold period (How, 2001; Ritter, 1984). Ritter's (1984) explanation for this effect was that underwriters exploited start-up natural resource firms during the commodity price boom in the 1980's.

In terms of junior mining IPOs listed on the TSX-V between 1997-2006 Smithson (2006) found no evidence for a hot period. This was confirmed by comparing the average underpricing of IPOs in the period of 1997 to 2003 to those listed between 2004 and 2006. This is in contrast to findings by How (2001) who reported a hot issue period for mining IPOs on the ASX between 1985 and 1987. Naturally these findings suggest that the presence of a hot issue or cold issue period is stock market and time period specific. The work of Ritter (1984) and How (2001) suggests that the presence of a hot issue market is linked to commodity price booms.

Market sentiment – Nguyen *et al.*, and Dimovski & Brooks (2004; 2008) define market sentiment as the change in the all ordinaries index on the relevant stock exchange from the date of the prospectus to the date of the listing. A positive coefficient was found in that the stronger the market sentiment during the period of the float, the higher the underpricing return. This is aligned with Ritter's (1984) "hot issue" market theory for natural resource IPOs.

Commodity sentiment – similar to above a resource of commodity specific index may be used. Dimovski & Brooks (2008) reported a statistically significant positive co-efficient for the gold market index in relation to underpricing. This is also aligned with Ritter's (1984) "hot issue" market theory for natural resource IPOs.

2.8. Novel Factors to Determine *Ex ante* Uncertainty of Junior Mining IPOs

A review of the value-relevance literature has revealed the following novel factors that may be applicable in determining the level of underpricing of junior mining IPOs.

Experience – Kreuzer, Etheridge & Guj (2007) argue in their analysis of Australian junior exploration floats, that the success of a new company may simply be linked to the capacity of the board and technical team to identify, pursue and realise value from opportunities. Cranstoun (2010) also states that one factor that is generally considered crucial to the value of a mining operation is the quality of management. If managers have a proven track record with other projects, the probability of their current undertaking being successful increases. Rudenno (2008) also argues that fundamental value is influenced by management's ability to find and develop economic deposits. Management should therefore have a track record of exploration success. In this regard one of the most important decisions by the management of a junior mining (exploration) company is the appointment of qualified competent geologist. This is because so much rides on the geologist's report which substantiates the geological data in the prospectus thereby evaluating the "opportunity" (How, 2001).

Accordingly experience may be defined as a factor (variable) that affects underpricing, with more board / managerial experience leading to less *ex ante* uncertainty. Accordingly an increase in experience, as measured by a proxy - the number of days between the date the qualifying geologist graduated and the date of the IPO, should lead to a decrease in underpricing. Hence a negative coefficient is expected.

Stage – Stage of development as defined by Lord, Etheridge, Willson, Hall & Uttley (2001), is more detailed than that given by the TSX-V which simply defines Tier 1 and Tier 2 ventures. Kreuzer *et al*. (2007) states that the size of the lease holding (area over

which a company has exploration rights), varies inversely with exploration stage. Accordingly a suitable proxy for stage of development may be given by the inverse of the size of the lease holding (km^{-2}). A negative coefficient is hypothesised in that the more advanced the stage of development the less the *ex ante* uncertainty and hence the lower the degree of underpricing. Further defence of this hypothesis is provided by Cranstoun (2010), who states that moving closer to development may boost share price in that investors may be aware that the cash received from the IPO could be pivotal in getting to the next stage of the company cycle.

Stock market tier – many stock markets have listing tiers or sub-boards with slightly less onerous listing requirements for smaller IPOs. For mining listings on the TSX-V two tiers are apparent: Tier 1 companies require a material interest in an advanced exploration property, a significant amount of working capital, and $2million in net tangible assets. While Tier 2 companies simply require an interest in a qualifying property and somewhat less onerous working capital requirements (TSX, 2009). In theory Tier 2 should therefore be more risky, and therefore more underpriced, compared to Tier 1 companies.

2.9. Conclusions Regarding Factors Pertinent to this Study

The italicised factors below have been found to be unsuccessful in explaining the underpricing of Australian and / or Canadian junior mining IPOs (Table 1). These factors will therefore not be tested in this study. Rather the underlined factors, that have proven to be statistically relevant in explaining the underpricing of Australian and / or Canadian junior mining IPOs, or that are novel and need further refinement, will be tested in this study.

Table 1: Summary of Factors

Firm Specific Factors		
Factor	**Reference**	**Finding**
Age	*How, 2001*	*Not significant*
Growth opportunity	*How, 2001*	*Not significant*
Geologist reputation	*How, 2001*	*Not significant*
Stage	Cranstoun, 2010	More resolution needed / Novel
Experience	Suggested by various	Novel

Market Specific Factors		
Factor	**Reference**	**Finding**
Hot / cold – period	How, 2001	Time period / commodity boom dependant
Market sentiment	Dimovski & Brooks, 2008 Nguyen et al., 2007	Significant
Commodity sentiment	Dimovski & Brooks, 2008 Nguyen et al., 2007	Significant
Stock market tier	-	Novel

Issue Specific Factors		
Factor	**Reference**	**Finding**
Underwritten	*Dimovski & Brooks, 2008*	*Most IPOs are underwritten*
Underwriter reputation	*Smithson, 2006 How, 2001*	*Not significant*
Underwriter domicile	*Cranstoun , 2010*	*Not significant*
Underwriter options	Dimovski & Brooks, 2008 Nguyen et al, 2008	Significant
Delay	Nguyen et al., 2007 How, 2001	Significant
Total capitalisation	Dimovski & Brooks, 2008 Nguyen et al., 2007 Smithson, 2006 How, 2001	Conflicting findings

3. RESEARCH HYPOTHESES

From the literature review, a case for the inclusion of the following factors in the forecasting of the degree of underpricing is justified. Accordingly this study will examine how these factors affect the estimation of the degree of underpricing of junior mining companies listed on the TSX-V between 2005 and 2007.

Research questions are typically used in a descriptive study (Blumberg, Cooper, & Schindler, 2008). Here the topic is typically new and under researched and the literature does not provide solutions to the research objectives. Since several studies have been performed on the underpricing of IPOs research questions will not be employed.

Propositions are statements about concepts that may be judged true or false if it refers to the observable phenomena (Blumberg *et al*., 2008). When propositions are formulated for empirical testing they are referred to as hypotheses. In this study correlation hypotheses are proposed in that we are not implying a cause and effect relationship (Blumberg *et al*., 2008).

Accordingly the following hypotheses are proposed:

Hypothesis 1: The initial abnormal return of newly listed mining stocks on the TSX-V over 2005 – 2007 is greater than zero.

This hypothesis is therefore designed to test if underpricing is apparent over the period of interest. The null hypothesis is that the average initial abnormal return is less than or equal to zero, in other words underpricing is not apparent. While the alternate hypothesis states that the average initial abnormal return of stocks over this period are greater than zero.

$H1_0$: $\mu_{IAR} \leq 0$

$H1_A$: $\mu_{IAR} > 0$

Hypothesis 2: The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is greater than that over the period 2002 – 2004.

This hypothesis is designed to test if a hot issue period is present over the time period of interest (2005-2007). Smithson (2006) found no evidence for a hot period on the TSX-V between 1997 and 2006, it can therefore be assumed that 2002 to 2004 should represent a cold period. The null hypothesis states that the average initial abnormal return over the 2002 – 2004 period, is greater or equal to that obtained over the 2005 – 2007 period. The alternate hypothesis states that the initial abnormal return over the 2005 – 2007 period is greater than that obtained over the 2002 – 2004 period.

$H2_0$: $\mu_{2002\text{-}2004} \geq \mu_{2005\text{-}2007}$

$H2_A$: $\mu_{2002\text{-}2004} < \mu_{2005\text{-}2007}$

Hypothesis 3: The amount of capital raised (TOTALCAP) in the IPO of mining stocks on the TSX-V over 2005 – 2006 does influence the initial abnormal market return.

The null hypothesis states that the average initial abnormal return of all IPOs is similar regardless of the amount of capital raised in each IPO. The alternate hypothesis states that the average initial abnormal return is different for at least two groups of IPOs segregated based on the amount of capital raised.

$H3_0$: $\mu_{<\$1million} = \mu_{\$1\text{-}<1.5million} = \mu_{\$1.5\text{-}<2million} = \mu_{2\text{-}<4million} = \mu_{>4million}$

$H3_A$: at least two μ differ

Hypothesis 4: The choice of underwriter does affect the initial returns of new mining listings over 2005 – 2007 on the TSX-V.

The null hypothesis states that the average initial abnormal return of a group IPOs segregated based on their underwriter is similar. By contrast the alternative hypothesis is that the means initial abnormal return of at least two of these groups, describing IPOs by discreet underwriters, is different.

$H4_0$: $\mu_{underwriterA} = \mu_{underwriterB} = \mu_{underwriterC} = \mu_{underwriterD} \cdots$

$H4_A$: at least two μ differ

Hypothesis 5: The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is affected by the "tier" category into which the company lists.

Since only two tier categories exist on the TSX-V the null hypothesis states that the average initial abnormal returns (IAR) of IPOs listing on tier 1 do not differ from those listing on tier 2. The alternate hypothesis states that the average initial abnormal returns of IPOs listing on each tier do differ.

$H5_0$: $\mu_{Tier1} = \mu_{Tier2}$

$H5_A$: $\mu_{Tier1} \neq \mu_{Tier2}$

Hypothesis 6: Market sentiment (MKSENTI), as determined by the change in the TSX-V index between the date of the published prospectus and the date of the IPO, correlates with the degree of underpricing (IAR).

$IAR_i = \beta_1 \times MKTSENTI_i + \varepsilon_i$

$H6_0$: $\beta_1 = 0$

$H6_A$: $\beta_1 \neq 0$

Hypothesis 7: The delay in listing (DELAY), as determined by the number of days between the date of the published prospectus and the date of the IPO, correlates with the degree of underpricing (IAR).

$IAR_i = \beta_2 \times DELAY_i + \varepsilon_i$

$H7_0$: $\beta_2 = 0$

$H7_A$: $\beta_2 \neq 0$

Hypothesis 8: The experience of the firm (EXPERIENCE), represented by a proxy - the number of days between the date the qualifying geologist graduated and the date of the IPO, correlates with the degree of underpricing (IAR).

$IAR_i = \beta_3 \times EXPERIENCE_i + \varepsilon_i$

$H8_0$: $\beta_3 = 0$

$H8_A$: $\beta_3 \neq 0$

Hypothesis 9: The stage of development (STAGE), as determined by the inverse of the area held in the exploration claim, correlates with the degree of underpricing (IAR).

$IAR_i = \beta_4 \times STAGE_i + \varepsilon_i$

$H9_0$: $\beta_4 = 0$

$H9_A$: $\beta_4 \neq 0$

Hypothesis 10: The factors – market sentiment, delay, experience and stage all correlate to the degree of underpricing.

$IAR_i = \beta_1 \times MKTSENTI_i + \beta_2 \times DELAY_i + \beta_3 \times EXPERIENCE_i + \beta_4 \times STAGE_i + \varepsilon_i$

Where: IAR_i = the adjusted return for firm *i* on the first day of trading.

$MKSENTI_i$ = market sentiment for firm *i* = the change in the ordinaries index on the TSX-V between the date of the prospectus and the listing date of firm *i*.

$DELAY_i$ = the number of calendar days from the prospectus registration date to the listing date of firm *i*.

$EXPERIENCE_i$ = the number of days between the date the qualifying geologist graduated and the date of the IPO of firm *i*.

$STAGE_i$ = stage of development as given by the inverse of the size of the lease holding (km^{-2}) of firm *i*.

ε_i = unobserved scalar random variables (errors)

$H10_0$: $\beta 1 = \beta 2 = \beta 3 = \beta 4 = 0$

$H10_A$: At least one $\beta \neq 0$

The null hypothesis is that the coefficient of each factor is equal to zero, this implies that none of these factors are correlated to underpricing. While the alternative hypothesis states that one or more of these coefficients is significantly different from zero.

4. RESEARCH METHODOLOGY

Exploratory research of the relevant secondary data is documented in the literature review. This was performed in order to identify firm, issue and market specific factors that may affect the degree of underpricing of IPOs. Based on this work numerous relationships and regression models containing established and novel factors are hypothesised. This research is therefore quantitative and causal in nature, since an attempt is being made to identify the cause and effect relationship between pertinent factors and the degree of underpricing.

4.1. Markets and Time Periods Investigated

The hypotheses were applied to historical secondary data of junior mining companies listed on the TSX-V from 2005 to 2007.

4.2. Unit of Analysis

The unit of analysis sets the level at which the research is performed and which objects are researched (Blumberg *et al*., 2008). Since this study investigated the suitability of various factors in estimating the degree of underpricing of junior mining companies, listed on the TSX-V between 2005 and 2007, the unit of analysis was set at the level of the company.

4.3. Population

A population is defined as the total collection of elements about which a researcher wishes to make some inferences (Blumberg *et al*., 2008). Accordingly the population is rooted in the research objective (Chipp, 2011). Here the primary population of relevance consists of junior mining companies that listed on the TSX-V between 2005 and 2007.

4.4. Sampling Frame

A sampling frame is defined by Zikmund (2003) as a list of elements from which a sample can be drawn. The mining companies TSX data file (TSX, 2011) which documents the IPOs of such companies on the TSX-V provides a lists of elements from which a sample was drawn.

4.5. Sampling Method

According to Zikmund (2003) a sample is a subset from a larger population, sampling involves any procedure that uses a portion of the population to infer conclusions about the population. All mining listings on the TSX-V between 2005 – 2007 (as given in the sampling frame) were considered, however the use of Event Study Methodology resulted in the elimination of some elements.

4.5.1. Event Study Methodology

Since each IPO took place at varying times in the period between 1 January 2005 and 31 December 2007 the Event Study Methodology as first proposed by Fama, Fisher, Jensen, and Roll (1969) was used. Event Study Methodology is a method used to assess the impact of an event (e.g. IPO) on the value of a firm.

4.5.2. Event Definition

A transformation was performed in order to normalise the time line of events according to the following:

T_{-1} – T_0 – estimation period – not available since the company is not yet listed

T_0 – T_1 – event / detection window – the listing / the first day of trading (9:30am – 4pm)

T_1 – T_2 – post event window – ignored in this study

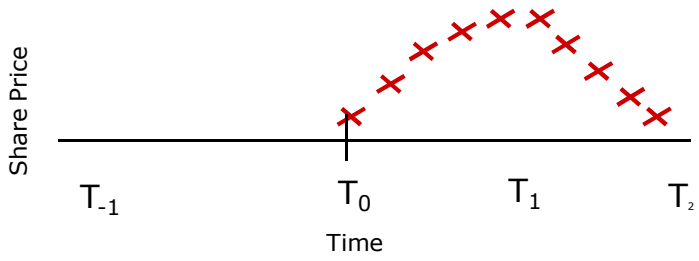

Figure 6: Schematic of Event Study Timeline

4.5.3. Selection Criteria

Events included in the sample were the initial public offering of junior mining companies on the TSX-V between 2005 and 2007. From the total population of junior mining companies that listed on the TSX-V between 2005 and 2007 the following were removed:

1. Companies with any missing factors required for hypothesis testing.
2. Companies whose shares did not trade on the listing day (confounding event).

4.6. Data Collection and Calculations

Data was collected for junior mining companies that listed on the TSX-V between 2005 and 2007 and met the selection criteria stated above.

4.6.1. Initial Abnormal Return

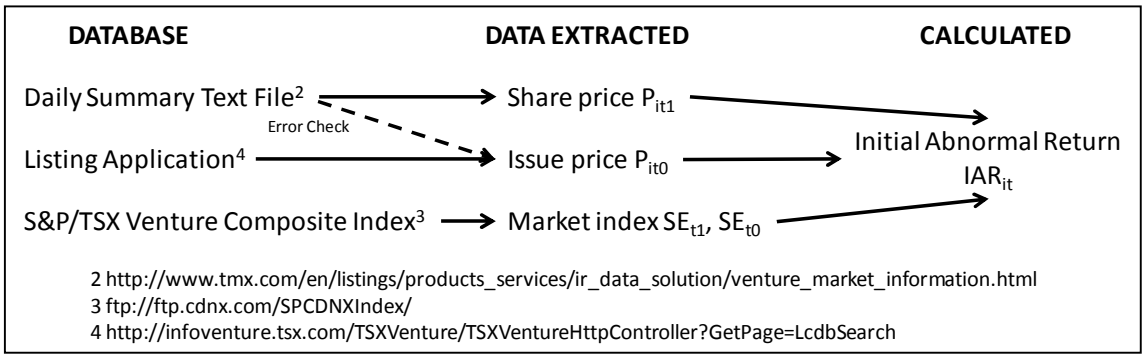

Figure 7: Data Collection Method to Determine Underpricing

In order to determine underpricing, or initial abnormal return, the following databases were accessed and the following data extracted (Figure 7).

After the event (IPO), and within the detection window, the abnormal return attributable to the event (IPO) being studied was found. This was determined by taking the difference between the actual return and the benchmark. The problem in dealing with IPO's is that there is no suitable estimation period to provide the benchmark or normalised expectation of return behaviour. In this case the normalised expectation of return behaviour is estimated using a matched firm approach (Smith, 2011). This involves subtracting the return of an appropriate benchmark over the same investment horizon (Smithson & Firer, 2007). The initial abnormal return of a single stock was calculated as follows:

Equation 3: Abnormal Market Adjusted First Day Return of Stock i

$$IAR_{it} = R_{it} - R_{mt}$$

Where: IAR_{it} = the Initial Abnormal Return for firm i in period t

R_{it} = the return for firm i in event period t

R_{mt} = the return on the benchmark index during the corresponding time period

t = the event period, the first day of trading

The degree of underpricing was determined according to the following equation:

Equation 4: Underpricing Return of Firm i

$$Rit = \frac{P_{i_{T1}} - P_{i_{T0}}}{P_{i_{T0}}}$$

Where: P_{iT0} = the issue price of the IPO at the start of the event period t

P_{iT1} = the share price at the close of the event period t (the first day of trading)

In this case the matched firm benchmark consists of the return on the TSX-V share index over the corresponding time period.

Equation 5: Return on the Share Index

$$R_{mt} = \frac{SE_{T1} - SE_{T0}}{SE_{T0}}$$

Where: SE_{T1} = share index value at the end of event period t

SE_{T0} = share index value at the beginning of the event period t

4.6.2. Factors to Determine Ex Ante Uncertainty

In order to obtain the pertinent factors that determine *ex-ante* uncertainty, of the listings of interest, the following databases were accessed and data extracted (Figure 8).

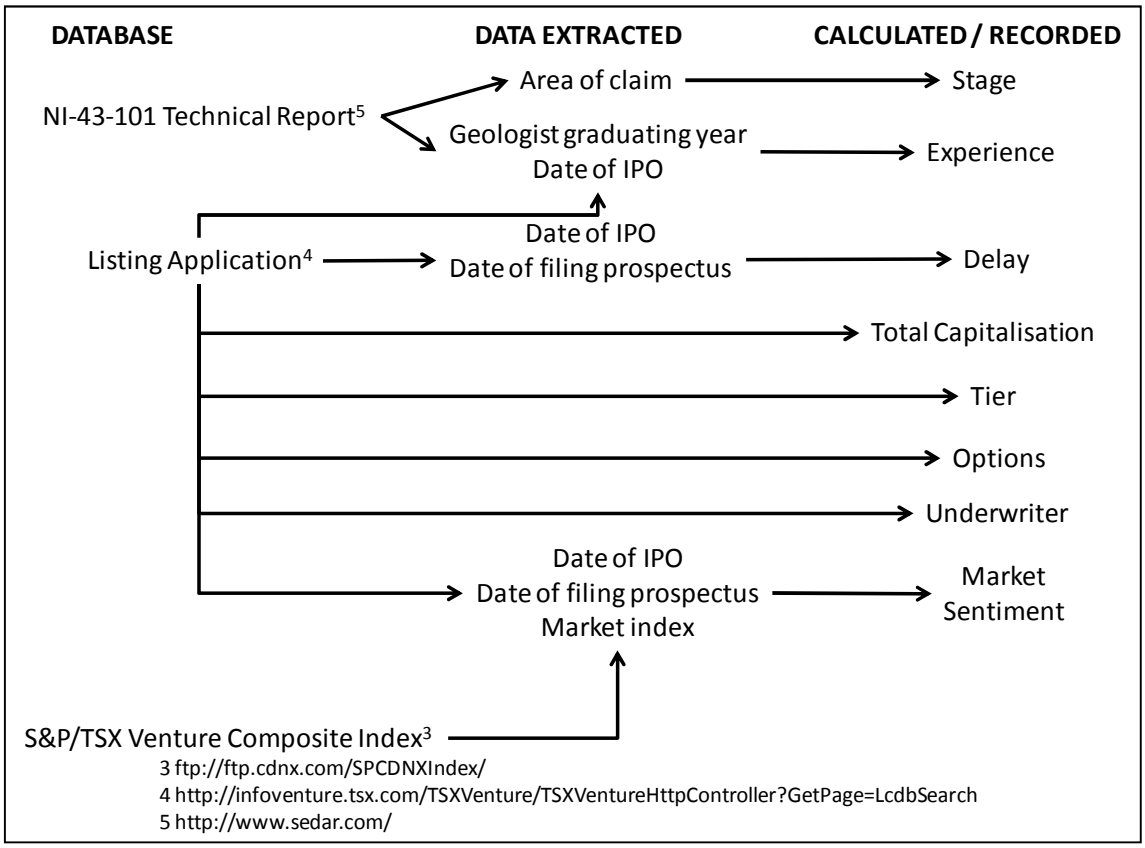

Figure 8: Data Collection Method to Determine Factors That Estimate Ex Ante Uncertainty

The following equations were used to determine each of these factors:

Equation 6: Stage of Development

$$Stage = \frac{1}{Area\ held\ in\ exploration\ claim} = \frac{1}{km^2}$$

Equation 7: Company Experience

$$Experience = days\ between\ date\ of\ IPO\ and\ geologist\ graduating$$

Equation 8: Delay in Listing (Nguyen et al., 2007; How, 2001)

$$Delay = days\ between\ date\ of\ IPO\ and\ filing\ of\ prospectus$$

Equation 9: Market Sentiment (Dimovski & Brooks, 2008; Nguyen et al., 2007)

$$Market\ Sentiment = \frac{SE_{IPO} - SE_{PF}}{SE_{PF}}$$

Where: SE_{IPO} = share index value at date of IPO

SE_{PF} = share index value at prospectus filing date

4.6.3. Hot and Cold Period

The section above describes how first day share price data and company IPO factors (characteristics) were collated for junior mining listings on the TSX-V between 2005 and 2007. This is referred to as data set 1.

In order to test the hypothesis if a hot period is apparent over the time period of interest (2005-2007) first day price share price was obtained from Smithson (2006) for junior mining listings on the TSX-V between 2002 and 2004. Here the assumption was that 2002-2004 represents a cold period in that Smithson (2006) found no evidence of a hot period over this timeframe. This data was worked up in an identical fashion to that

described previously to determine initial abnormal return. This is referred to as data set 2.

4.7. Statistical Analysis

The datasets listed above were compiled in chronological order in excel and exported to NCSS for statistical analysis.

4.7.1. Descriptive Statistics

Descriptive statistics were run for the data-sets, in order to analyse the initial abnormal returns and the characteristics (factors) of mining listings between 2005 – 2007. This analysis provided information on the centrality and spread of the data distributions as well as the calculated sample means.

4.7.2. Box Plots

In common with other IPO studies (Smithson & Firer, 2007; How, 2000) outliers were removed from the data prior to the testing of the various hypotheses. This method establishes five statistics; minimum, maximum, 1st, 2nd and 3rd quartiles. Here an outlier was classified as having a greater or less than 1,5 times the inter quartile range.

4.7.3. Hypothesis Testing about Means

Hypothesis testing in which the comparison of means was performed was done at the 95% confidence interval employing NCSS. The following tests were performed to reject or accept each hypothesis:

Hypothesis 1: Wilcoxon Signed-Rank Test – this nonparametric version of the one sample T-test was employed to estimate whether the mean initial abnormal return was greater than the hypothesised mean of zero.

Hypothesis 2: Mann-Whitney U test – this nonparametric version of the two sample T-test was employed to estimate whether the mean initial abnormal returns obtained over two discreet time periods were significantly different from each other.

Hypothesis 3 – 5: Kruskal-Wallis one way analysis of variance (ANOVA) on ranks – this nonparametric version of the one way ANOVA was employed to determine if the means of two or more independent sub groups are significantly different.

4.7.4. Regression

Hypothesis 6 – 9: Linear regression was attempted to identify the relationship between the various independent variables (X) that were hypothesised to have an influence on the dependant variable (Y), the initial abnormal return. The model was represented by the following equation:

Equation 10: Linear Regression

$$Y = \beta \times X + \varepsilon$$

Where: Y = the dependant variable (initial abnormal return, underpricing)

β = coefficient

X = independent variable (factor, company characteristic)

ε = error variable

Linear regression was run in NCSS, the model was interpreted using the R^2 coefficient, and was deemed to be of use if a large amount of the variation in the dependant variable was explained by the model. A significance test was also applied to the slope (β) to determine if it was significantly different to a hypothesised slope of zero.

Hypothesis 10: Multiple Regression

In order to establish if any of the independent variables (X_i), given in the data-set, are correlated with each other a correlation table was formed using the Pearson product moment correlation coefficient or simply the correlation coefficient (Adjasi *et al.*, 2011). Typically positive or negative values between 0 – 0.09 indicate no correlation, while values between 0.1 – 0.3 show weak, 0.3 – 0.5 medium and 0.5 – 1 strong correlation. This said the interpretation of a correlation coefficient depends on the context and purposes. It was envisaged found to be strongly correlated may therefore be combined.

A multiple regression model was formed in an attempted to indentify the relationship between the various independent variables (X_i –factors / company characteristics) that were assumed to have an influence on the dependant variable (Y – initial abnormal return / underpricing). The model was represented by the following equation:

Equation 11: Multiple Regression

$$Y= \beta_1 \times X_1 + \beta_2 \times X_2 + \beta_3 \times X_3 + \beta_4 \times X_4 \ldots\ldots..+ \beta_i \times X_i + \varepsilon_i$$

Where: Y = the dependant variable (initial abnormal return, underpricing)

β_1- β_i = coefficients

X_1-X_i = independent variables (factors / company characteristics)

ε = error variable

Accordingly the unknown parameters (β_1 – β_i) in the regression model were estimated, while it was assumed that the errors follow a normal distribution conditional on the regressors ($\varepsilon \sim N(0,\sigma^2)$).

The t-statistic and p-value indicate whether the null hypotheses listed for each dependent variable may be rejected or not. The β coefficients of the regression model were reported along with their t statistics and p-values in order to assess the statistical suitability of each co-efficient at the 95% confidence level.

The coefficient of determination (R^2) and the adjusted coefficient of determination (R^2-adj), which accounts for an increase in the degrees of freedom, were used in assessing the overall fit of the model.

Under the assumption of normality the F-statistic tries to test the hypothesis that all co-efficients (except ε) are equal to zero. A p-value smaller than 0.05 indicates that this hypothesis may be rejected at the 95% confidence level.

4.8. Research Limitations

The data is limited to mining companies listed on the TSX-V between 2005 and 2007, hence the coefficients of the proposed regression model may be specific to this context. In other words the coefficients may only apply to the 2005 – 2007 "hot issue" period and may not be suitable for estimating the degree of underpricing during a "cold issue" period or for non-mining listings. A further limitation may be the regression model itself, which incorporates (and excludes) certain factors (independent variables) based on exploratory research of secondary data. The selection of these factors may therefore present a substantial limitation of bias for the research.

4.8.1. Confounding Events

Confounding factors are extraneous variables in a statistical model that correlate (positively or negatively) with both the dependent variable and the independent variable (Zikmund, 2003). Hence confounding factors may result in Type 1 error, an erroneous

conclusion that the dependent variables are in a causal relationship with the independent variables. Confounding factors that may be present include:

Systematic risk – in other words market risk. The initial abnormal returns (IAR_{it}) were not explicitly adjusted for systematic risk. The systematic risk adjustments necessary for the (single day) initial returns should be negligibly small when compared to the average expected initial returns (Smithson & Firer, 2007).

Significant announcements - made just before the IPO these may serve to increase the first day share price through increased market exposure.

Institutional mechanism for delivering shares to the public – depending on the transaction shares may be sold sequentially (best efforts underwriting), or all at once (firm commitment underwriting). Rock (1986) argues that the essentials are the same and that the mechanism is irrelevant as far as underpricing is concerned. Therefore there should be no correlation between the mechanism of listing (e.g. true IPO, or capital pool company) on the TSX-V and the degree of underpricing.

4.9. Conclusions Regarding Research Methodology

The following schematic summarises the research methodology employed.

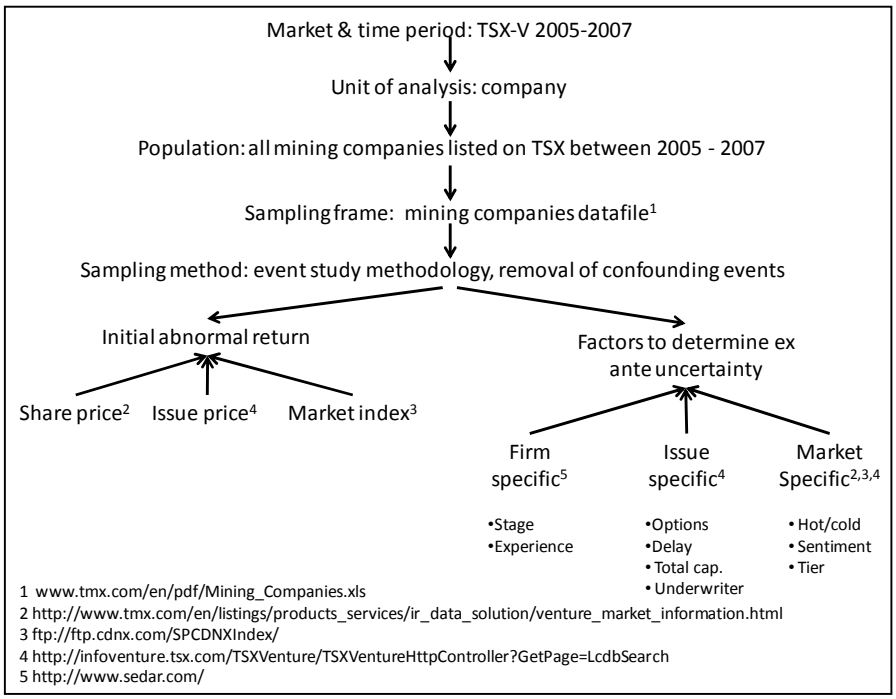

Figure 9: Research Methodology Summary Schematic

Table 2: Summary of Statistical Tests Employed

Hypothesis No. 1	The initial abnormal return of newly listed mining stocks on the TSX-V over 2005 – 2006 is greater than zero.	Wilcoxon Signed-Rank Test.
Hypothesis No. 2	The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is greater than that over the period 2002 – 2004.	Mann-Whitney U test.
Hypothesis No. 3	The amount of capital raised (TOTALCAP) in the IPO of mining stocks on the TSX-V over 2005 – 2006 does influence the initial abnormal market return.	Kruskal-Wallis one way analysis of variance (ANOVA) on ranks.
Hypothesis No. 4	The choice of underwriter does affect the initial returns of new mining listings over 2005 – 2007 on the TSX-V.	Kruskal-Wallis one way analysis of variance (ANOVA) on ranks.
Hypothesis No. 5	The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is affected by the "tier" category into which the company lists.	Kruskal-Wallis one way analysis of variance (ANOVA) on ranks.
Hypothesis No. 6	Market sentiment correlates with the degree of underpricing.	Linear regression.
Hypothesis No. 7	The delay in listing correlates with the degree of underpricing.	Linear regression.
Hypothesis No. 8	The experience of the geologist correlates with the degree of underpricing.	Linear regression.
Hypothesis No. 9	The stage of development correlates with the degree of underpricing.	Linear regression.
Hypothesis No. 10	The characteristics / factors – market sentiment, delay, experience and stage all correlate to the degree of underpricing.	Multiple regression.

5. RESULTS

Data set 1: First day share price data and company characteristics were collated for new mining listings on the TSX-V between 2005 and 2007. A total of 127 cases were identified from the sampling frame (Mining companies TSX datafile). Due to incomplete data, in terms of company prospectuses and technical reports available on SEDAR, and confounding events (some company's shares did not trade on their first day of listing) the sample was reduced to 50 cases.

Data set 2: First day share price data (and not company characteristics) were obtained from Smithson (2006) for listings between 2002 and 2004. In terms of 2002 to 2004 data, a total of 53 cases were identified by Smithson (2006).

The S&P TSX-V daily composite index was obtained for 2002 to 2007 in order to calculate the initial abnormal return of the stocks in the periods stated above.

5.1. Descriptive Statistics Analysis

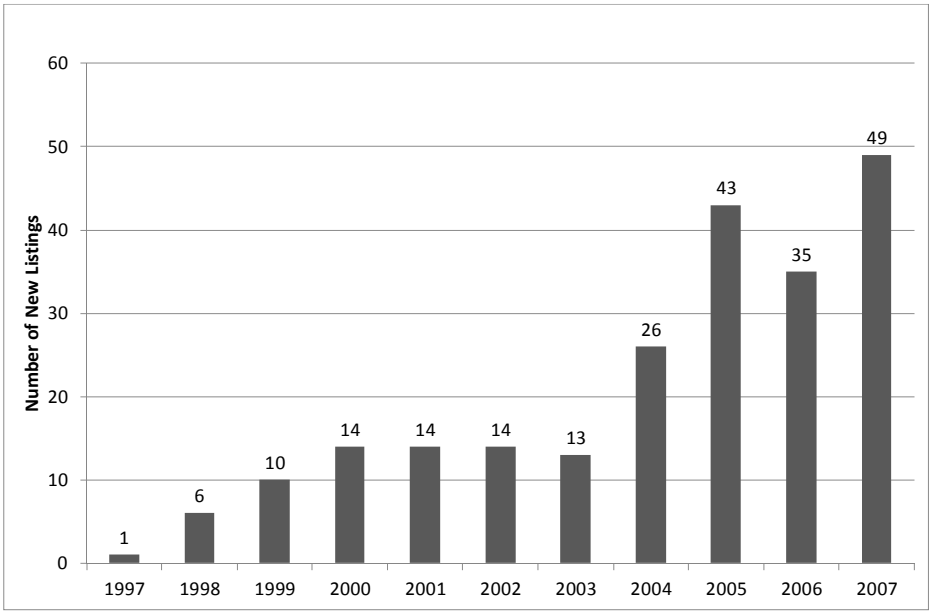

Figure 10: Number of Mining Listings by Year (1997 – 2004 adapted from Smithson, 2006)

The number of mining companies listing on the TSX-V can be seen to rapidly increase between 1997 and 2000, stabilise between 2000 – 2003, and increase once again between 2004 – 2007 (Figure 10).

This is somewhat correlated with the general increase in commodity prices starting in mid 2003, as represented by the IMF commodity metal price index (2005 = 100, Figure 11). Although correlation does not prove cause and effect - it is known that mining listings on the TSX-V represent the single largest sector - making up approximately 55% of the total listings and 59% of the total market capitalisation of the exchange (TSX, 2010). Since the exchange is dominated by mining companies it is unsurprising that the S&P TSX-V composite index should correlate to the commodity metals price index (Figure 11).

The number of new mining listings increased sharply between 2004 and 2005, this correlates with a sharp increase in the commodities and composite indices. Accordingly the end of 2004 seems to be a "turning point" that divides two periods of interest.

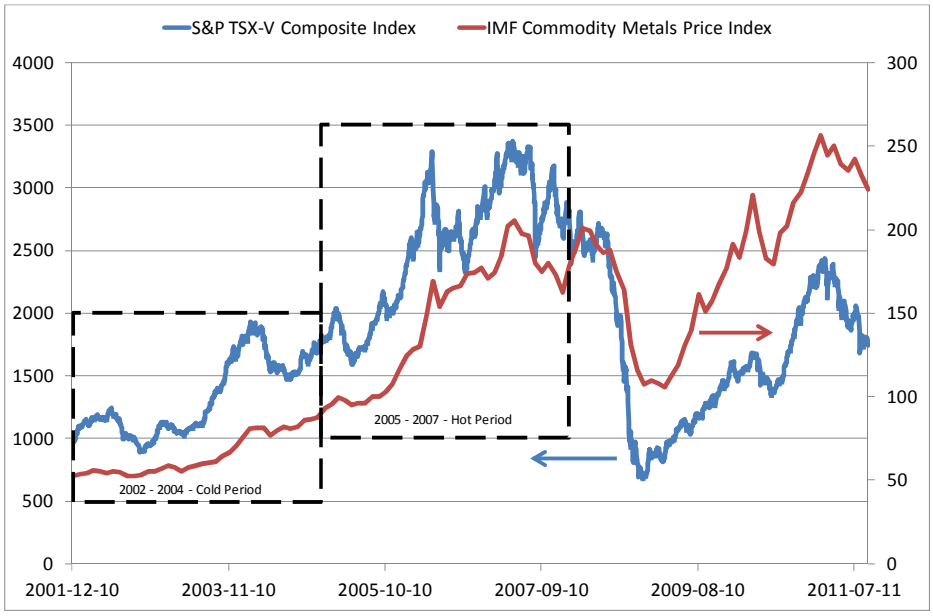

Figure 11: Metals Price and TSX-V Indexes over Period of Interest

The first period of interest is 2005 to 2007 (the proposed hot period) – here this study attempts to correlate company characteristics to initial abnormal return. The second period 2002 – 2004 (the proposed cold period) – here this study attempts to compare the initial abnormal return of mining IPO's in this period to that of the hot period.

5.1.1. Observed Initial Abnormal Return

In common with other IPO studies outliers were removed from the data prior to testing the various hypotheses (Smithson & Firer, 2007; How, 2000). Outliers were identified using box plots of the initial abnormal return of mining IPO's for each year between 2005 and 2007.

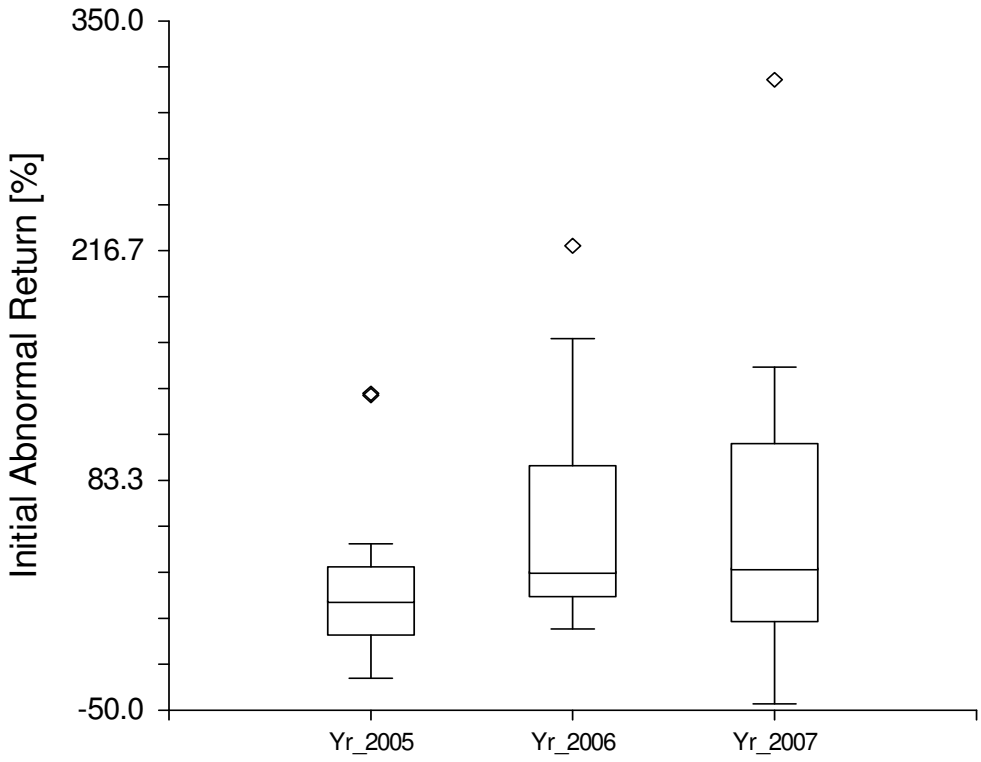

Figure 12: Box Plot of Initial Abnormal Return (2005 – 2007)

Here outliers are defined as values greater or less than 1.5 times the inter quartile range (How, 2000). A total of four outliers were found, all mild in that they were greater than 1.5 times and less than 3 times the inter quartile range (2005, 133.88%, 132.74%; 2006,

219.04%; 2007, 315.90%). Four outliers out of 50 new listings (cases) were therefore identified and removed from the data set resulting in a total of 46 cases (Figure 12 and Figure 13). Observation of the mean initial abnormal return per year, for the 2002-2007 period, shows that the data can be influenced by the outliers (Figure 14).

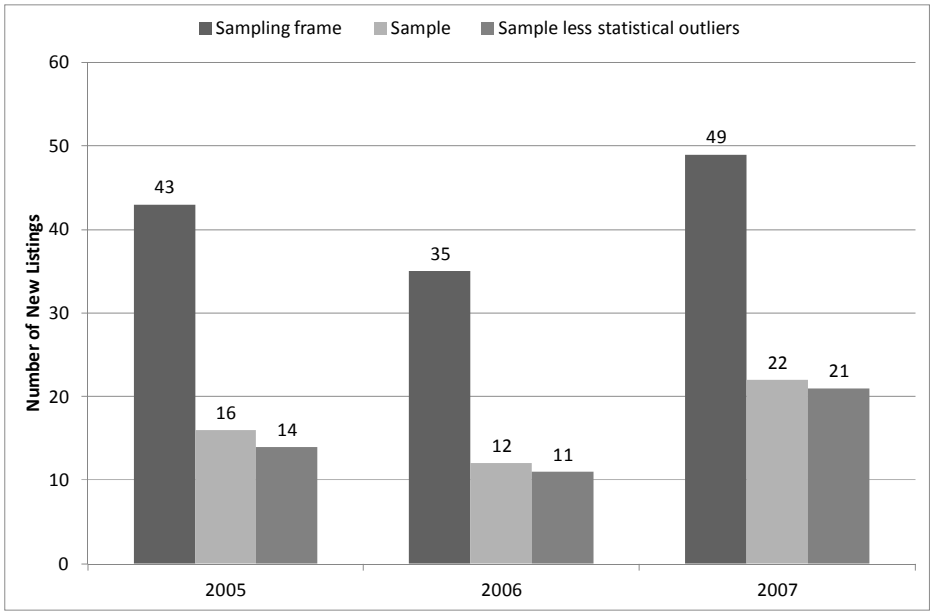

Figure 13: Sample of New Mining Listings on TSX-V (2005 – 2007)

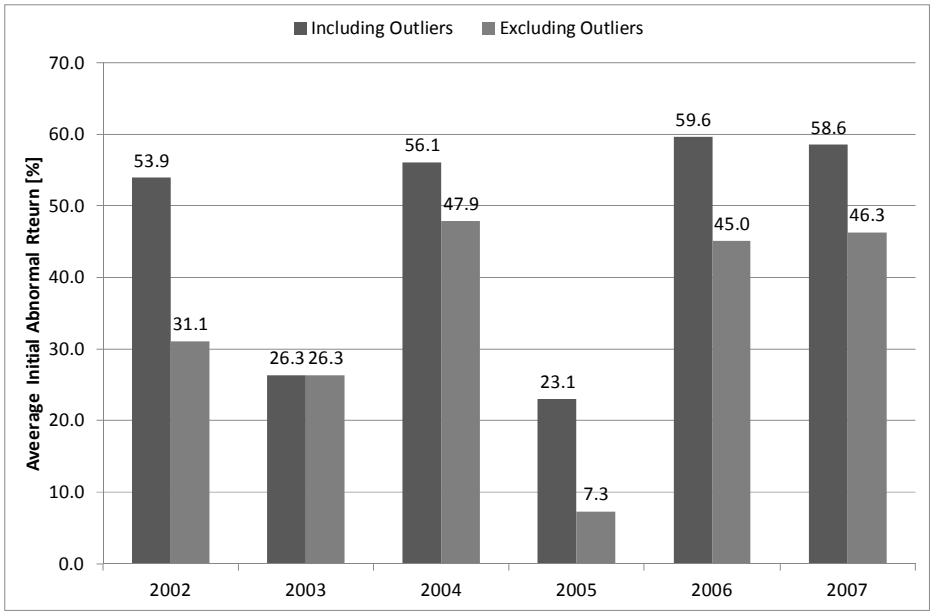

Figure 14: Average Initial Abnormal Return by Year (2002 – 2007; 2002 – 2004 adapted from Smithson 2006)

Table 3: Average Initial Abnormal Return 2005 - 2007

	Sample size	Mean Initial Abnormal Return	Standard Deviation
		[%]	[%]
2005 - 2007	50	47.44	68.69
excluding outliers	46	34.13	48.67
2005	16	23.05	47.27
excluding outlier	14	7.30	20.98
2006	12	59.58	68.74
excluding outlier	11	45.04	49.06
2007	22	58.55	79.19
excluding outlier	21	46.30	55.81

Table 4: Average Initial Abnormal Return 2002 – 2004 (adapted from Smithson 2006)

	Sample size	Mean Initial Abnormal Return	Standard Deviation
2002 - 2004	53	48.22	70.63
excluding outliers	51	38.13	48.55
2002	14	53.91	102.89
excluding outlier	13	31.09	59.74
2003	13	26.33	27.20
excluding outlier	13	26.33	27.20
2007	26	56.09	64.68
excluding outlier	25	47.93	50.54

5.1.2. Observed Company Characteristics

It must be emphasised that this study uses two data sets. The first consists of first day share price data and company characteristics for new mining listings on the TSX-V between 2005 and 2007. The second consists only first day share price data (and not company characteristics) for listings between 2002 and 2004.

Table 5: Factors (Characteristics) of New Mining Listings 2005 - 2007

Variables	Unit	Mean	Standard Deviation	Median	Maximum	Minimum
Experience	Yrs	32.07	9.50	33.08	50.92	4.96
Stage	1/km2	0.078	0.195	0.020	1.282	0.001
Delay	Days	37.39	22.42	29.00	101.00	7.00
Total Capitalisation	Can $	2,381,615	2,654,417	1,530,500	16,000,000	399,900
Market Sentiment	%	-0.30	8.45	0.98	20.29	-18.15
		Y	N			
Options	1=Y 0=N	43	3			

Table 5 shows the descriptive statistics for the characteristics of junior mining IPOs that listed on the TSX-V between 2005 – 2007 (statistical outliers removed). The experience of the company was determined by a proxy namely the experience of the senior geologist or "qualified person" set out in the technical report (National Instrument 43-101). This was calculated by working out the number of years between the geologist graduating with an undergraduate degree and the listing date of the mining IPO concerned. The average experience is approximately 32 years.

In terms of stage of development this is determined by a proxy which is the inverse of the area held in the exploration claim. Here the average stage of development is 12.8km^2 with a maximum > 1000km^2 and a minimum of 0.78km^2.

In terms of the delay, the time between the prospectus filing date and the listing date of the company, the average time is approximately 37 days, this similar to the stated listing time (6 – 8 weeks) given by the TSX (TSX, 2010). The average total capitalisation is $2,16 million with a minimum value of $0.399 million and maximum amount raised being $16million.

Market sentiment is specified as the difference between the S&P TSX-V composite index on the prospectus filing date and the listing date of the company. The average index change is found to be close to zero however deviations of approximately +/- 20% are possible.

Finally in terms of share options only 3 cases out of a total sample of 46 were found not to offer share options to the underwriters. Therefore options were removed as an independent variable since a statistically significant sample could not be obtained.

5.2. Hypothesis Testing

All the hypotheses were tested using the initial abnormal return excluding outliers. As per Smithson (2006) this data was considered to be more normally distributed than that containing outliers. All statistical tests were performed at the 95% confidence level.

5.2.1. Initial Abnormal Return

Smithson (2006) showed that the initial return for new mining listings (R_{it}) on the TSX-V between 1997 and the first half of 2006 was significantly greater than zero and stated that underpricing of mining IPO's was found to exist. In terms of the initial abnormal return (IAR_{it}), in which the change in the market index is taken into account (R_{mt}), the observations of Figure 14 and Table 3 suggest that underpricing may be apparent in the period of 2005 – 2007.

Hypothesis 1:

The initial abnormal return of newly listed mining stocks on the TSX-V over 2005 – 2007 is greater than zero.

$H1_0$: $\mu_{IAR} \leq 0$

$H1_A$: $\mu_{IAR} > 0$

A one sample T-test was not employed in that (Hintze, 2007):

1. a non-random sampling method was employed in collecting the 46 cases.
2. the data does not follow the normal probability distribution.

Instead, the distribution of differences was found to be symmetrical but not normal and therefore a nonparametric test (Wilcoxon Signed-Rank Test) was employed.

Table 6: Wilcoxon Signed-Rank Test of Initial Abnormal Return (2005 – 2007)

Descriptive Statistics Section						
			Standard	**Standard**	**95.0% LCL**	**95.0% UCL**
Variable	**Count**	**Mean**	**Deviation**	**Error**	**of Mean**	**of Mean**
IAR	46	34.128	48.671	7.176	19.675	48.581
Wilcoxon Signed-Rank Test for Difference in Medians						
W	**Mean**	**Std Dev**	**Number**	**Number Sets**	**Multiplicity**	
Sum Ranks	**of W**	**of W**	**of Zeros**	**of Ties**	**Factor**	
932.5	540.5	91.529	0	1	6	
Approximation With Continuity Correction						
Alternative		**Prob**	**Reject H0**			
Hypothesis	**Z-Value**	**Level**	**at .050**			
Median>0	4.277	<0.000	Yes			

Table 6 shows that the average initial abnormal return for a sample of 46 newly listed mining stocks on the TSX-V was 34.1%, with a standard deviation of 48.7%. At the 95% significance level the Z-Value was 4.277 at a P level <0.001 hence the null hypothesis was rejected in favour of the alternative hypothesis. It was therefore concluded that the initial abnormal return for new mining listings on the TSX-V between 2005 – 2007 was significantly greater than zero, and that underpricing of mining IPO's was found to exist.

5.2.2. Hot and Cold Listing Periods

A "hot" period is defined as a time period when returns on new listings are higher than average, compared to a cold period which is just the opposite. This effect, for resource stocks, has also been linked to the number of listings - with Ritter (1984) stating that high volume listing periods follows high average initial return periods. On the TSX-V 2004 seems to be a transition year with 2005 – 2007 showing a higher number of new mining IPO's compared to the 2002 – 2004 period directly prior (Figure 10). In order to

test if hot and cold periods are present on the TSX-V the mean initial abnormal return over 2005 – 2007 was compared with that of 2002 – 2004.

Hypothesis 2:

The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is greater than that over the period 2002 – 2004.

$H2_0$: $\mu_{2002\text{-}2004} \geq \mu_{2005\text{-}2007}$

$H2_A$: $\mu_{2002\text{-}2004} < \mu_{2005\text{-}2007}$

A two sample T test could not be performed in that both data sets (2002-2004 and 2005-2007) do not follow the normal probability distribution. Accordingly given that the variances were found to be equal the nonparametric Mann-Whitney U test was employed.

Table 7: Mann-Whitney U test of Listing Period

Descriptive Statistics Section						
			Standard	**Standard**	**95.0% LCL**	**95.0% UCL**
Variable	**Count**	**Mean**	**Deviation**	**Error**	**of Mean**	**of Mean**
2002 -2004	53	48.215	70.626	9.701	28.748	67.682
2005-2007	46	34.128	48.671	7.176	19.675	48.581
Mann-Whitney U Test for Difference in Medians						
	Mann	**W**	**Mean**	**Std Dev**		
Variable	**Whitney U**	**Sum Ranks**	**of W**	**of W**		
2002 -2004	1370	2801	2650	142.537		
2005-2007	1068	2149	2300	142.537		
Number Sets of Ties = 0, Multiplicity Factor = 0						
Approximation With Correction						
Alternative		**Prob**	**Reject H0**			
Hypothesis	**Z-Value**	**Level**	**at .050**			
Diff<0	-1.063	0.856	No			
Difference: (2002-2004)-(X2005-2007)						

At the 95% significance level the Z-Value was -1.063 at a P level of 0.856 hence the null hypothesis cannot be rejected in favour of the alternative hypothesis. It was

therefore concluded that the initial abnormal return for new mining listings on the TSX-V between 2005 – 2007 was not greater than that over the period 2002 – 2004. Accordingly no evidence of the hot and cold period effect was found.

5.2.3. The Effect of Amount of Capital Raised

Hypothesis 3:

The amount of capital raised (TOTALCAP) in the IPO of mining stocks on the TSX-V over 2005 – 2006 does influence the initial abnormal market return.

$H3_0$: $\mu_{<\$1million} = \mu_{\$1-<1.5million} = \mu_{\$1.5-<2million} = \mu_{2-<4million} = \mu_{>4million}$

$H3_A$: at least two μ differ

The data set was divided into five groups, those having a total capitalisation of less than $1 million, $1-<1.5 million, $1.5-<2 million, $2-<4 million and finally those greater than $4 million. The groups were roughly equal in size, with the smallest group having 7 cases.

Table 8: Kruskal-Wallis One-Way ANOVA of IAR by Capital Raised

Test Results					
		Chi-Square	**Prob**		
Method	**DF**	**(H)**	**Level**	**Decision(0.05)**	
Not Corrected for Ties	4	5.324	0.256	Do not reject H0	
Corrected for Ties	4	5.324	0.256	Do not reject H0	
Number Sets of Ties	0				
Multiplicity Factor	0				
Group Detail					
		Sum of	**Mean**		
Group	**Count**	**Ranks**	**Rank**	**Z-Value**	**Median**
<1million	10	319	31.9	2.237	62.485
1-<1.5million	10	193	19.3	-1.119	21.4
1.5-<2million	11	233	21.18	-0.657	14.82
2-<4million	8	179	22.38	-0.261	17.09
>4million	7	157	22.43	-0.229	24.38

The Kruskal-Wallis one-way ANOVA on ranks was used in that the normality of the five groups was called into question due to the small sample size. This test is a nonparametric substitute for the one-way ANOVA when the assumption of normality is not valid (Hintze, 2007).

The significance level of H assuming a Chi-square distribution, is 0.256, since this is greater than the required level of significance (0.05) the null hypothesis cannot be rejected. It was therefore concluded that the means of the initial abnormal returns of newly listed mining companies on the TSX-V did not differ significantly on the basis of the capital raised during the IPO.

5.2.4. The Effect of Underwriter

Hypothesis 4:

The choice of underwriter does affect the initial returns of new mining listings over 2005 – 2007 on the TSX-V.

$H4_0$: $\mu_{underwriterA} = \mu_{underwriterB} = \mu_{underwriterC} = \mu_{underwriterD} \cdots$

$H4_A$: at least two μ differ

The data set was divided into groups of underwriters responsible for five or more listings, the remaining companies were grouped as "other". Due to the difference in size between some of the groups the Kruskal-Wallis one-way ANOVA on ranks was used in that the normality of certain groups was called into question.

The significance level of H assuming a Chi-square distribution, is 0.367, since this is greater than the required level of significance (0.05) the null hypothesis cannot be rejected. It was therefore concluded that the initial abnormal return of newly listed mining companies on the TSX-V did not differ significantly on the basis of the underwriter used for the IPO.

Table 9: Kruskal-Wallis One-Way ANOVA of IAR by Underwriter

Test Results					
		Chi-Square	**Prob**		
Method	**DF**	**(H)**	**Level**	**Decision(0.05)**	
Not Corrected for Ties	4	4.296	0.367	Do not reject H0	
Corrected for Ties	4	4.296	0.367	Do not reject H0	
Number Sets of Ties	0				
Multiplicity Factor	0				
Group Detail					
		Sum of	**Mean**		
Group	**Count**	**Ranks**	**Rank**	**Z-Value**	**Median**
Bolder Investment Partners Inc.	5	94	18.80	-0.829	12.572
Canaccord Capital Corp.	8	175	21.88	-0.377	13.006
Haywood Securities Inc.	8	160	20.00	-0.812	13.587
Other	19	454	23.89	0.167	28.252
Wolverton Securities Ltd.	6	198	33.00	1.859	62.488

5.2.5. The Effect of Listing Tier

Companies listing on the TSX-V fall into two sets of listing requirements. Tier 1 companies require a material interest in an advanced exploration property, significant amounts of working capital, and $2million in net tangible assets. While Tier 2 companies simply require an interest in a qualifying property and somewhat less onerous working capital requirements (TSX, 2009). In theory Tier 2 should be more risky, and therefore more underpriced, compared to Tier 1 companies.

Hypothesis 5:

The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is affected by the "tier" category into which the company lists.

$H5_0$: $\mu_{Tier1} = \mu_{Tier2}$

$H5_A$: $\mu_{Tier1} \neq \mu_{Tier2}$

A two sample T test could not be performed in that the Tier 2 data set does not follow the normal probability distribution. Accordingly given that the variances were found to be equal the nonparametric Mann-Whitney U test was employed.

Table 10 Mann-Whitney U test of Initial Abnormal Return by Tier

Descriptive Statistics Section						
			Standard	Standard	95.0% LCL	95.0% UCL
Variable	Count	Mean	Deviation	Error	of Mean	of Mean
Tier1	8	36.285	63.422	22.423	-16.737	89.307
Tier2	38	36.835	52.331	8.489	19.635	54.036
Mann-Whitney U Test for Difference in Medians						
	Mann	W	Mean	Std Dev		
Variable	Whitney U	Sum Ranks	of W	of W		
Tier1	145	181	188	34.498		
Tier2	159	900	893	34.498		
Number Sets of Ties = 8, Multiplicity Factor = 48						
Approximation With Correction						
Alternative		Prob	Reject H0			
Hypothesis	Z-Value	Level	at .050			
Diff<>0	-0.188	0.851	No			
Difference: (Tier1)-(Tier2)						

At the 95% significance level the Z-Value was -0.188 at a P level of 0.851 hence the null hypothesis cannot be rejected in favour of the alternative hypothesis. It was therefore concluded that the mean initial abnormal return for new mining listings on the TSX-V between 2005 – 2007 listing in category Tier 1 was not statistically from that different that listing in category Tier 2. The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is not affected by the "Tier" category in which the company lists.

5.2.6. Multiple Regression

In trying to test if other proposed independent variables have any influence on the initial abnormal return multiple regression was employed. From the statistical tests conducted previously it has already been found that tier, underwriter and the amount of capital

raised are not relevant. This section therefore documents an attempt to correlate numerical continuous quantitative data with initial abnormal return of mining companies listed on the TSX-V between 2005 – 2007.

5.2.6.1. Autocorrelation

Autocorrelation is a type of correlation used to measure whether values of a time series are related to their own past values (Albright, 2009). This is significant in that the presence of autocorrelation among the residuals has several negative impacts on multiple regression, most importantly in this study any hypothesis tests or confidence limits that required the use of the t or F distribution would be invalid (Hintze, 2007). Accordingly a test for autocorrelation was performed on the initial abnormal return for mining stocks on the TSX-V between January 2002 and December 2007. Here adapted data (2002 – 2006) from Smithson (2006) was combined with that of this study (2005 – 2007) to perform such an analysis.

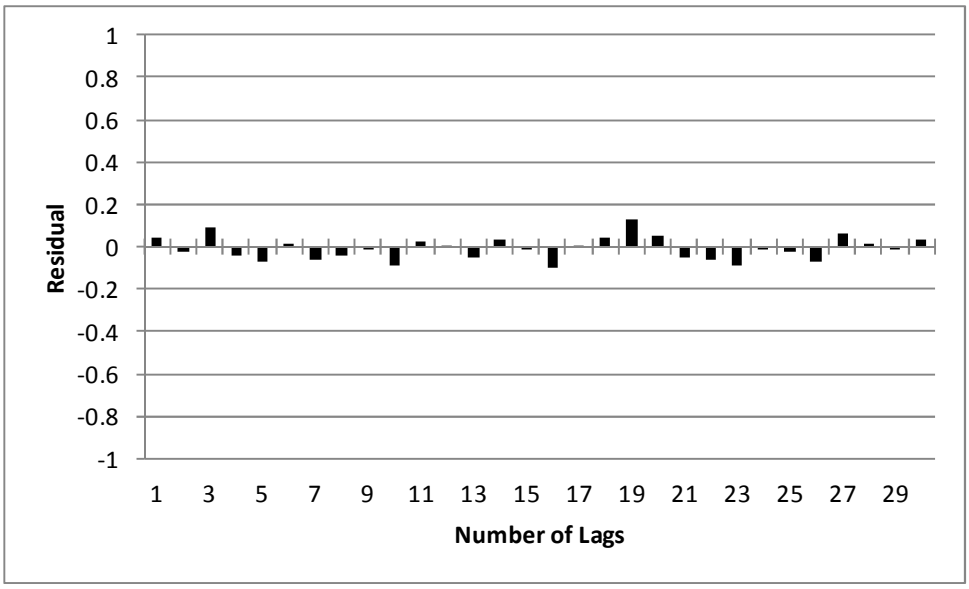

Figure 15: Autocorrelation Plot of IAR 2002 - 2007

The number of lags selected was approximately 25% of the total 133 cases available. The maximum absolute residual value on the autocorrelation plot was found to be 0.132

this is less than the two standard errors in magnitude (0.173). It can therefore be concluded that the initial abnormal return for mining stocks on the TSX-V are not related to their own past values.

5.2.6.2. Multicollinearity

Collinearity is defined as the association, measured as the correlation, between two independent variables. Multicollinearity refers to the correlation among three or more independent variables. The presence of muticollinearity reduces any single independent variables predictive power by the extent to which it is associated with the other independent variables (Hair, 2010). This inflates the standard errors of the regression coefficients, deflates the partial t-tests for the regression coefficients, gives false nonsignificant p-values, and degrades the predictability of the model (Hintze, 2007). In this case multicollinearity may occur due to independent variables that are higher powers or interactions of an original set of variables.

In common with other underpricing studies a Pearson correlation matrix (row-wise deletion) of the explanatory variables is used to detect multicollinearity (Adjasi *et al*., 2011; Dimovski & Brooks, 2008, Nguyen *et al*., 2007). In terms of short comings, it must be remembered that Pearson type correlations are unduly influenced by outliers, unequal variances, nonnormality, and nonlinearities (Hintze, 2007).

Table 11: Pearson Correlation Matrix between Independent Variables

	Experience	Stage	Options	Delay	Total_Cap	Market Sentiment
Experience	1					
Stage	-0.181	1				
Options	-0.367	0.057	1			
Delay	-0.250	0.082	0.294	1		
Total Capitalisation	0.333	-0.169	-0.570	-0.241	1	
Market Sentiment	-0.087	0.008	0.203	0.225	-0.037	1

Here it can be seen that there is a “significant” correlation between Total Capitalisation and Options (r=-0.570, n=45, p<0.0005) as well as Experience and Options (r=-0.367,

n=45, p<0.012). Upon closer examination one can see that these correlations are erroneous in that the presence of underwriter options (Options) is a dummy variable that describes categorical nominal data. It was therefore concluded that multicollinearity is not a feature of the group of independent variables chosen.

5.2.6.3. Market Sentiment

Hypothesis 6:

$IAR_i = \beta_1 \times MKTSENTI_i + \varepsilon_i$

$H6_0$: $\beta_1 = 0$

$H6_A$: $\beta_1 \neq 0$

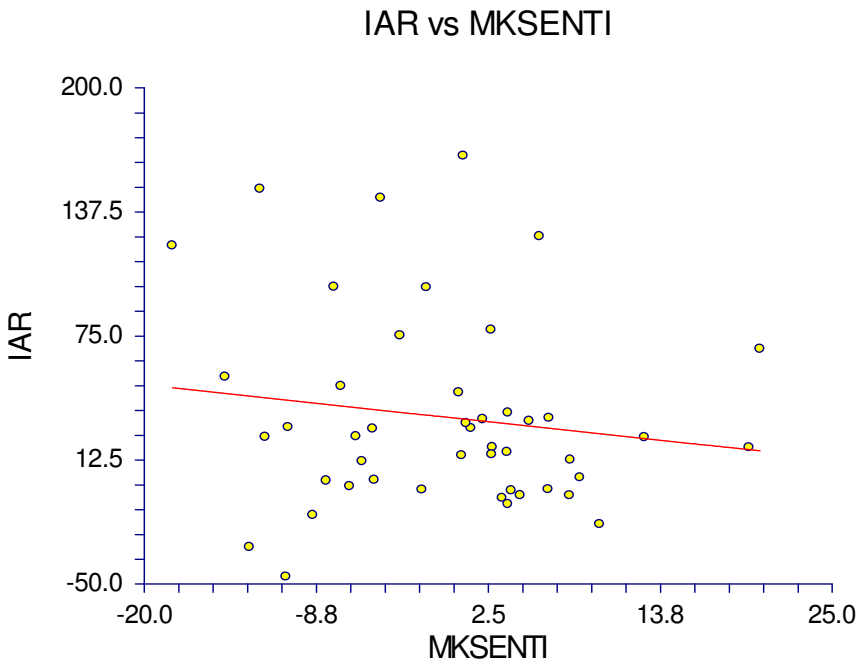

Figure 16: Scatter Plot of Initial Abnormal Return vs. Market Sentiment

The equation of the straight line relating IAR and MKSENTI is estimated as (using the 46 observations in this dataset):

IAR =(33.881) + (-0.826)*MKENTI

The value of R^2, the proportion of the variation in IAR that can be accounted for by variation in MKSENTI, is 0.021. This means that the independent variable (MKSENTI) explains only approximately 2.1% of the variation in the dependant variable (IAR). A significance test that the slope is zero resulted in a t-value of -0.961. The significance level of this t-test is 0.342. Since 0.342 > 0.050, the hypothesis that the slope is zero is not rejected.

Table 12: Regression Estimation Section – IAR vs MKSENTI

Regression Estimation Section		
	Intercept	**Slope**
Parameter	**εi**	**β1**
Regression Coefficients	33.881	-0.826
Lower 95% Confidence Limit	19.397	-2.558
Upper 95% Confidence Limit	48.365	0.906
Standard Error	7.187	0.859
Standardized Coefficient	0.000	-0.143
T Value	4.714	-0.961
Prob Level (T Test)	0.000	0.342
Reject H0 (Alpha = 0.0500)	Yes	No

It was therefore concluded that the market sentiment, as determined by the change in the TSX-V index between the date of the published prospectus and the date of the IPO, has no influence on the degree of underpricing (initial abnormal market return).

5.2.6.4. Listing Delay

Hypothesis 7:

$IAR_i = \beta_2 \times DELAY_i + \varepsilon_i$

$H7_0$: $\beta_2 = 0$

$H7_A$: $\beta_2 \neq 0$

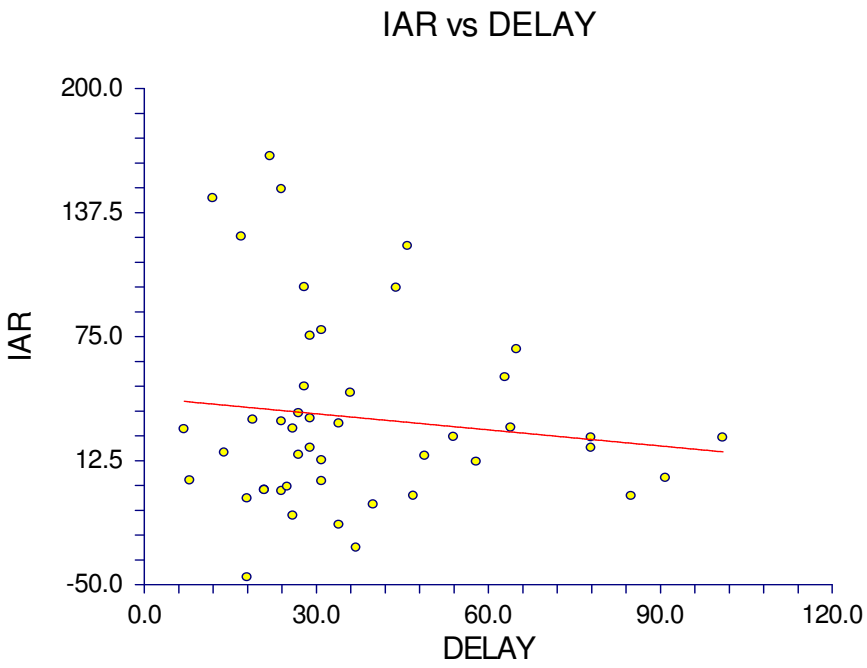

Figure 17: Scatter Plot of Initial Abnormal Return vs. Listing Delay

The equation of the straight line relating IAR and DELAY (using the 46 observations in this dataset) is estimated as:

IAR = (44.230) + (-0.270)*DELAY

The value of R^2, the proportion of the variation in IAR that can be accounted for by variation in DELAY, is 0.016. This means that the independent variable (DELAY) explains only approximately 1.6% of the variation in the dependant variable (IAR). A significance test that the slope is zero resulted in a t-value of -0.832. The p-value of this t-test is 0.410. Since 0.410 > 0.050, the hypothesis that the slope is zero is not rejected.

Table 13: Regression Estimation Section – IAR vs DELAY

Regression Estimation Section		
	Intercept	Slope
Parameter	εi	β2
Regression Coefficients	44.230	-0.270
Lower 95% Confidence Limit	15.783	-0.925
Upper 95% Confidence Limit	72.678	0.384
Standard Error	14.115	0.325
Standardized Coefficient	0.000	-0.125
T Value	3.134	-0.832
Prob Level (T Test)	0.003	0.410
Reject H0 (Alpha = 0.0500)	Yes	No

It was therefore concluded that the delay in listing, as determined by the number of days between the date of the published prospectus and the date of the IPO, has no influence on the degree of underpricing (initial abnormal market return).

5.2.6.5. Experience

Hypothesis 8:

$IAR_i = \beta_3 \times EXPERIENCE_i + \varepsilon_i$

$H8_0: \beta_3 = 0$

$H8_A: \beta_3 \neq 0$

The equation of the straight line relating IAR and EXPERIENCE is estimated (using the 46 observations in this dataset) as:

IAR = (20.514) + (0.425)*EXPERIENCE

The value of R^2, the proportion of the variation in IAR that can be accounted for by variation in EXPERIENCE, is 0.007 This means that the independent variable (EXPERIENCE) explains only approximately 0.7% of the variation in the dependant variable (IAR). A significance test that the slope is zero resulted in a t-value of 0.552.

The p-value of this t-test is 0.584. Since 0.584 > 0.050, the hypothesis that the slope is zero is not rejected.

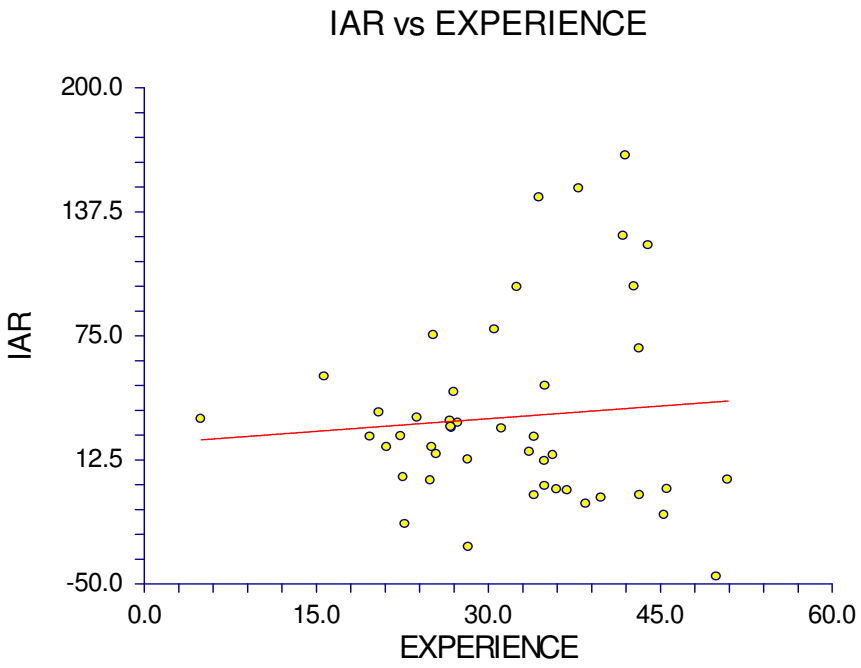

Figure 18: Scatter Plot of Initial Abnormal Return vs. Experience

Table 14: Regression Estimation Section – IAR vs EXPERIENCE

Regression Estimation Section		
	Intercept	**Slope**
Parameter	**εi**	**β3**
Regression Coefficients	20.514	0.425
Lower 95% Confidence Limit	-31.324	-1.127
Upper 95% Confidence Limit	72.353	1.976
Standard Error	25.722	0.770
Standardized Coefficient	0.000	0.083
T Value	0.798	0.552
Prob Level (T Test)	0.429	0.584
Reject H0 (Alpha = 0.0500)	No	No

It was therefore concluded that the experience of the firm listing, as determined by the number of days between the date the qualifying geologist graduated and the date of the IPO, has no influence on the degree of underpricing (initial abnormal market return).

5.2.6.6. Stage

Hypothesis 9:

$IAR_i = \beta_4 \times STAGE_i + \varepsilon_i$

$H9_0: \beta_4 = 0$

$H9_A: \beta_4 \neq 0$

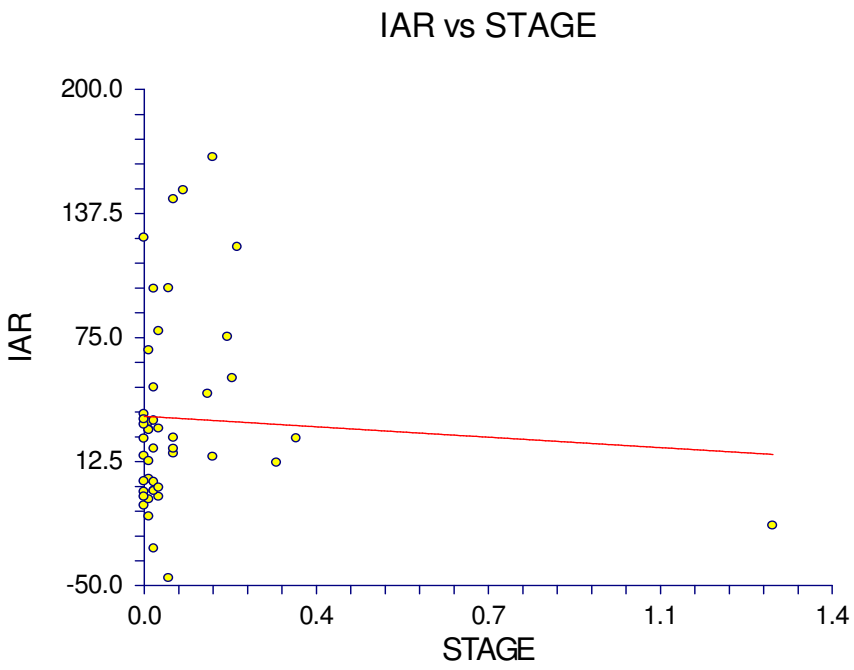

Figure 19: Scatter Plot of Initial Abnormal Return vs. Stage

The equation of the straight line relating IAR and STAGE (using the 46 observations in this dataset) is estimated as:

IAR = (35.300) + (-15.014)*STAGE.

The value of R^2, the proportion of the variation in IAR that can be accounted for by variation in STAGE, is 0.004. This means that the independent variable (STAGE) explains only approximately 0.4% of the variation in the dependant variable (IAR). A significance test that the slope is zero resulted in a t-value of -0.400. The p-value of this t-test is 0.691. Since 0.691 > 0.050, the hypothesis that the slope is zero is not rejected.

Table 15: Regression Estimation Section – IAR vs STAGE

Regression Estimation Section		
	Intercept	Slope
Parameter	εi	β4
Regression Coefficients	35.300	-15.014
Lower 95% Confidence Limit	19.552	-90.643
Upper 95% Confidence Limit	51.047	60.616
Standard Error	7.814	37.527
Standardized Coefficient	0.000	-0.060
T Value	4.518	-0.400
Prob Level (T Test)	0.000	0.691
Reject H0 (Alpha = 0.0500)	Yes	No

It was therefore concluded that the stage of the firm listing, as determined by the inverse of the area held in the exploration claim, has no influence on the degree of underpricing (initial abnormal market return).

5.2.6.7. Multiple Regression Model

Hypothesis 10:

$IAR_i = \beta_1 \times MKTSENTI_i + \beta_2 \times DELAY_i + \beta_3 \times EXPERIENCE_i + \beta_4 \times STAGE_i + \varepsilon_i$

$H10_0$: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$

$H10_A$: At least one $\beta \neq 0$

The equation relating IAR with all the independent variables is:

IAR=-0.695*MKSENTI-0.180*DELAY+0.223*EXPERIENCE-11.127*STAGE+34.346

Table 16: Statistical Summary of Multiple Regression

	β co-efficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	T-Value	Prob Level
Intercept	34.346	33.442	-33.191	101.883	1.027	0.310
MKSENTI	-0.695	0.908	-2.529	1.139	-0.765	0.449
DELAY	-0.180	0.352	-0.891	0.532	-0.510	0.613
EXPERIENCE	0.223	0.824	-1.441	1.888	0.271	0.788
STAGE	-11.127	38.957	-89.802	67.548	-0.286	0.777
F-ratio	0.360					
Prob Level	0.836					
R^2	0.034					
Adj. R^2	<0.000					

The significance level of the t-test for each coefficient is > 0.05 hence the null hypothesis that each co-efficient is zero is not rejected. In terms of assessing the model as a whole, the F-ratio (0.360) is small indicating that a large proportion of the sum of squares is not explained by the model. This is seen in the coefficient of determination (R^2) which indicates that only 3.4% of the variation of the dependent variable is explained by the regression. The adjusted R^2, which penalises for the use of each extra independent variable, shows a value close to zero. This in turn is reflected in the probability value (Prob Level) which is greater than the 95% confidence level (namely 0.05). Accordingly we cannot reject the null hypothesis which states that all of the regression coefficients are equal to zero.

5.3. Summary of Hypothesis Testing

Table 17: Summary Table of Hypothesis Testing

Hypothesis No. 1	The initial abnormal return of newly listed mining stocks on the TSX-V over 2005 – 2006 is greater than zero.	Reject H_0 – underpricing is apparent.
Hypothesis No. 2	The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is greater than that over the period 2002 – 2004.	Cannot reject H_0 – no evidence of the hot and cold period was found.
Hypothesis No. 3	The amount of capital raised (TOTALCAP) in the IPO of mining stocks on the TSX-V over 2005 – 2006 does influence the initial abnormal market return.	Cannot reject H_0 – the amount of capital raised does not affect the degree of underpricing.
Hypothesis No. 4	The choice of underwriter does affect the initial returns of new mining listings over 2005 – 2007 on the TSX-V.	Cannot reject H_0 - the degree of underpricing did not differ significantly on the basis of the underwriter used for the IPO
Hypothesis No. 5	The initial abnormal return of newly listed mining stocks on the TSX-V over the period of 2005 – 2007 is affected by the "tier" category into which the company lists.	Cannot reject H_0 – the degree of underpricing did not differ significant on the basis of the "tier" category.
Hypothesis No. 6	Market sentiment correlates with the degree of underpricing.	Cannot reject H_0 – no correlation found.
Hypothesis No. 7	The delay in listing correlates with the degree of underpricing.	Cannot reject H_0 – no correlation found.
Hypothesis No. 8	The experience of the geologist correlates with the degree of underpricing.	Cannot reject H_0 – no correlation found.
Hypothesis No. 9	The stage of development correlates with the degree of underpricing.	Cannot reject H_0 – no correlation found.
Hypothesis No. 10	The characteristics – market sentiment, delay, experience and stage all correlate to the degree of underpricing.	Cannot reject H_0 – no correlation found.

6. DISCUSSION

6.1. Initial Abnormal Return

The initial abnormal return of new mining listings on the TSX-V between January 2005 and December 2007 (the proposed "Hot Period") was found to average 34.1% with a standard deviation of 48.7%. This average was found to be statistically different from zero hence underpricing of mining IPO's was found to exist (Table 5).

Table 18: Comparison of Initial Abnormal Returns from Various Studies

Author	Stock Exchange	Period	Stock Type	IAR %	No IPO's	Notes
Ritter (1984)	US SEC Registered	1977-82	Natural Resouces	56.2	242	-
Ritter (1984)	US SEC Registered	1977-79	Natural Resouces	18.3	143	Cold Period
Ritter (1984)	US SEC Registered	1980-82	Natural Resouces	110.9	99	Hot Period
How (2001)	Australian	1979-1990	Mining	63.6	124	-
How (2001)	Australian	1979-1984	Mining	27.1	23	Pre-boom
How (2001)	Australian	1985-1986	Mining	82.9	89	Boom
How (2001)	Australian	1986-1990	Mining	-9.8	12	Post - crash
How (2001)	Australian	1979-1990	Gold	71.3	95	-
How (2001)	Australian	1979-1990	Other Metals	19.9	14	-
Kooli & Suret (2004)	Canada TSX + TSX-V	1991-1998	All IPO's	20.6	445	-
Kooli & Suret (2004)	Canada TSX + TSX-V	1991-1998	Mining	35.7	102	-
Nguyen et al. (2007)	Australia	1994-2004	Gold	13.8	90	-
Nguyen et al. (2007)	Australia	1994-2004	Other Metals	21.4	119	-
Smithson (2006)	Canada TSX-V	1997-mid-2006	Mining	38.9	142	-
Smithson (2006)	UK FTSE AIM	1997-mid-2006	Mining	6.3	142	-
Dimovski & Brooks (2008)	Australia	1994-2004	All IPO's	22.4	830	-
Dimovski & Brooks (2008)	Australia	1994-2004	Gold	13.3	113	-
Adjasi et al. (2011)	Nigeria	1990 - 2006	All IPO's	43.3	80	-
Adjasi et al. (2011)	Nigeria	1990 - 2006	Mining + Oil	69.4	8	-
This Study	Canada TSX-V	2002-2004	Mining	38.1	51	Proposed Cold Period
This Study	Canada TSX-V	2005-2007	Mining	34.1	46	Proposed Hot Period

Table 18 compares the findings of this study with previous research. The level of underpricing obtained in this study (34.1%) was very similar to that obtained by Smithson (2006), as well as Koolie & Suret (2002) – (38.9 & 35.7%). This confirms

Smithson's (2006) argument that a similar level of underpricing of Canadian mining IPO's has prevailed over time.

Interestingly "other mining" IPO's, in other words diversified non-gold mining listings, on the Australian Stock Exchange also show an almost constant level (19.9% vs. 21.4%) of underpricing over time (Nguyen *et al.*, 2007; How, 2001). The same cannot be said for Australian gold mining listings which show dramatic changes in underpricing (71.3% vs. 13.8%) over different time periods (Nguyen *et al.*, 2007; How, 2001).

The majority of listings on the TSX-V over the period of interest are diversified mineral exploration companies with only 6 out of the 46 cases being identified as gold companies. It can therefore be assumed that the mining IPO's in the data set represent "other mining" IPOs, as per How's (2001) definition. Therefore while How (2001) proved that the degree of underpricing is resource specific, and Smithson (2006) asserted that a similar level of underpricing of Canadian mining IPO's has prevailed over time, this study suggests that diversified mining IPO's (non-gold) show a similar level of underpricing of over time - at least on the TSX-V with secondary data indicating a similar finding on the Australian Stock Exchange (Nguyen *et al.*, 2007; How, 2001).

6.2. Hot and Cold Listing Periods

The initial abnormal return of new mining listings on the TSX-V between January 2002 and December 2004 (the proposed "Cold Period") was found to average 39.13% with a standard deviation of 48.6%. The range of maximum and minimum returns in this period (2002-2004) is therefore very similar to those in the 2005-2007 period. This contradicts Ritter's (1984) model which predicts the variation in initial returns should

be greater during a hot period (Figure 2). Indeed no statistical difference was found in the mean initial abnormal return of IPO's in each of these proposed time periods (Table 6). Therefore no evidence of the hot or cold period effect could be found.

This agrees with Smithson's (2006) findings for mining listings on the TSX-V and the AIM for the periods 1997-2003 and 2004-2006. However Ritter's (1984) study argues that for non-natural resource listings high average initial returns should be followed by a prolonged increase in the volume of IPO's. It may therefore be argued that the proposed years in which an increase in mining listings on the TSX-V are observed (2002 – 2007) do not represent a significant prolonged increase in the volume of IPO's. In other words the hot period may still be coming.

Alternatively How (2001) argued that the sensitivity of the pricing of IPO's could be correlated to market conditions. Here market conditions were exposed by "eyeballing" the stock market index. Indeed Figure 11 shows that two market conditions should exist, based on commodity price index and share price index movement, namely the (2002-2004) cold period and the (2005-2007) hot period. The fact that no significant difference in underpricing is observed in each of these periods suggests that *ex ante* risk of junior mining IPO's on the TSX-V is independent of commodity pricing and share price movement.

This can be explained in that How (2001) found this correlation for fairly advanced Australian mining companies that listed on the main board, as opposed to junior mining companies. This is supported by Rudenno (1998) who states that the first day share price movements of mining juniors cannot be tracked by factors (e.g. commodity prices, exchange rates and production) that affect established resource companies. Rather *ex ante* uncertainty is related to other factors (characteristics) as proposed (Table 1).

6.3. The Relationship of Amount of Capital Raised and Underpricing

Smithson (2006) found that smaller mining listings on the TSX-V between 1999 and the first half of 2006 were more underpriced than those listings where large amounts of capital were raised. By contrast the results of this study show that the initial abnormal return of newly listed mining companies listed on the TSX-V between 2005 – 2007 did not differ significantly on the basis of the capital raised.

Table 19: Comparison of Capital Raised from Various Studies

Author	Smithson (2006)	Smithson (2006)	Nguyen et al. (2007)	Dimovski & Brooks (2008)	This Study
Stock Exchange	TSX-V	AIM	ASX	ASX	TSX-V
Period	1997-mid-2006	1997-mid-2006	1994-2004	1994-2004	2005-2007
Stock Type	Mining	Mining	Other Metals	Gold	Mining
Mean Can$	1,459,087	7,393,264	18,340,000	14,437,719	2,381,615
Min Can$	200,000	0	-	-	399,900
Max Can$	15,000,000	80,000,000	-	-	16,000,000
Underpricing %	38.9	6.3	21.4	13.3	34.1

This result suggests, at least over this time period (2005-2007), that the amount of capital raised in a listing is not a proxy for its *ex ante* risk. Interestingly this agrees with Smithson's (2006) finding for mining IPO's on the AIM market over the period 1999 and the first half of 2006. It is speculated that the relationship between capital raised and underpricing may only be present during certain time periods and on certain stock markets.

A comparison of the mean and variation of capital raised in both studies is shown in Table 19. Another interesting fact, as seen in Table 19, is that the mining IPO's on the TSX-V are on average smaller than other stock exchanges. This would indicate that these listings should be more risky, and should therefore show a higher degree of underpricing. Indeed this seems to be the case when compared to listings on the ASX (Table 18), it is therefore speculated that the TSX-V is "home" to the listing of junior mining companies that require relatively small amounts of capital to conduct

exploration. As such these listings carry more *ex ante* risk compared to their senior counterparts on other stock exchanges. Accordingly investors in these junior ventures are rewarded with a higher degree of underpricing to compensate for this risk as per the Changing Risk Hypothesis (Figure 2).

6.4. The Relationship of Underwriter and Underpricing

Over the period of interest (2005–2007) no evidence was found to exist linking the underwriter and underpricing. This is in contrast to Smithson's (2006) study which found between 1997 – mid 2006 that two underwriters were involved in listings that had small negative returns. In comparing the two data sets it was noticed that Smithson's (2006) underpriced underwriters appear only once in our data set. Here the initial abnormal return of a listing by Northern Securities Inc. was found to be 33% (Table 9). This is very close to the average initial abnormal return of 34% for all listings between 2005-2007.

It is therefore speculated that the behaviour of such an underwriter changed from accurately pricing issues (1997 – 2005) to employing underpricing (2005-2007). This may have been in response to previous disgruntled investors and an attempt to protect their reputation (Dimovski & Brooks, 2008) however more work is needed in this regard.

6.5. The Relationship of Listing Tier and Underpricing

As explained previously, Tier 2 companies should be more risky and therefore intuitively more underpriced, compared to Tier 1 companies. The statistical evidence for the initial abnormal return for mining listings on the TSX-V over the 2005 – 2007 period indicates that the means do not differ over the two tier groups. This means that

the underpricing of a newly listed mining stock on the TSX-V over the period of 2005-2007 is not affected by the tier category in which the company lists.

There is therefore no gain to be had by an investor selectively picking issues from these two Tier categories. An explanation may be that the difference in listing criteria between Tier 1 and Tier 2 categories is not significant enough to distinguish the risk profile of companies listing in either tier. In other words the risk profile of companies listing in each tier is similar despite the fact that Tier 2 companies require $2 million tangible assets. More work is needed in this regard.

6.6. Multiple Regression Model

Table 20: Comparison of Regression Analysis from Various Studies

Author	Stock Exchange	Period	Stock Type	Statistically Significant Independent Variables	Statistically In-significant Independent Variables	Adj. R^2
How (2001)	Australia	1979-1990	Mining	**Delay, Market Sentiment**	Company Age, Capital Raised, Growth, Underwriter Reputation, Geologist Reputation, Share Retention, Packaged IPO, Hot/Cold Market	0.254-0.155
Smithson (2006)	Canada TSX-V	1997-mid-2006	Mining	None	Capital Raised, Underwriter	0.121
Smithson (2006)	UK FTSE AIM	1997-mid-2006	Mining	None	Nomimated Broker, Total Capital Raised	-0.015
Nguyen et al. (2007)	Australia	1994-2004	Resources	All Ordinaries Index, ASX Resources Index, **Market Sentiment, Delay**, Underwriter Options	Issue Price, Total size of issue, Share Options, Underwriter Options, Underwritten, Independent Auditor	0.057-0.046
Dimovski & Brooks (2008)	Australia	1994-2004	Gold	Underwriter Options, **Market Sentiment**, Gold Market Sentiment	Issue Price, Total Capital Raised, Underwritten, Dividend Yield, Share Options	0.148-0.023
Cranstoun (2010)	Various	2008-2010	Mining	None	Dilution, Benchmark Returns, Warrants ,**Stage (Producing vs. Non Producing)**, Underwriters domicile (Canadian vs. Other),	<0.000
This Study	Canada TSX-V	2005-2007	Mining	None	**Market Sentiment, Delay, Experience, Stage**	<0.000

The model derived by multiple regression could not accurately predict the degree of underpricing, the R^2 value was found to be 3.4% while the adjusted R^2 value was

approximately zero. Table 20 compares the findings of this study with previous research.

As can be seen this study performs similarly to Smithson's (2006) and Cranstoun's (2010) in terms of failing to find statistically significant independent variables and producing adjusted R^2 values close to zero. Further analysis and comparison will be drawn in terms of the independent variables:

6.6.1. Market Sentiment

A statistically insignificant relationship was found between initial abnormal return and market sentiment (MKSENTI) as determined by the change in the TSX-V index between the date of the published prospectus and the date of the IPO (Table 12). In terms of the multiple regression model a statistically insignificant negative coefficient of MKSENTI was found (Table 16).

Dimovski & Brooks (2008) found a statistically significant positive coefficient for the same independent variable while investigating underpricing of gold IPO's on the ASX. As did Nguyen *et al*. (2007) for resource IPO's on the ASX. It has been argued that the stronger the market sentiment during the period of the IPO, the higher the underpricing return (Dimovski & Brooks, 2008).

This is obviously not the case in this study, more work is needed to explore the index changes on the TSX-V and ASX to determine if this effect is isolated to a particular period. In other words investors on the TSX-V between 2005 – 2007 were exposed to an increasing composite index, as such underwriters may have already taken such changes into account. This could be done by extrapolating the index over the average delay period of listing (37 days).

6.6.2. Listing Delay

A statistically insignificant relationship was found between initial abnormal return and listing delay (DELAY) as determined by the number of days between the date of the published prospectus and the date of the IPO (Table 13). In terms of the multiple regression model a statistically insignificant negative coefficient of DELAY was found (Table 16).

How (2001) found DELAY to be the most significant variable in explaining the underpricing of mining IPO's on the ASX. Indeed the relationship between underpricing and DELAY was negative implying that IPO's with shorter delay in listings are more underpriced. This finding was also supported for non-mining Australian IPO's (How *et al*., 1995). Similar results were reported by Nguyen *et al*. (2007) regarding resource sector IPO's.

The fact that our finding is statistically insignificant implies that DELAY does not influence the degree of underpricing for mining listings on the TSX-V between 2005-2007. This implies that the winner's curse phenomenon, as per the information asymmetry hypothesis (2.3.2), is not apparent for such IPO's. It is speculated that junior mining IPO's on the TSX-V are different in nature from other resource stocks, especially those on the ASX that are more "mature". Accordingly TSX-V junior mining listings file fairly simple prospectuses which reduces the winners curse in that the "uninformed" investors can quickly lessen the information heterogeneity between them and the more informational privileged investors.

In other words the nature of junior mining IPO's (no production or sales only exploration) means that the only information available is the prospecting report – as such the information difference (asymmetry) between informed and un-informed

investors is low. This results in a fairly similar degree of underpricing as significant periods of time are not required in order to become informed. The mean delay time seems to support this argument with mining listings on the TSX-V averaging 37 days (Table 5), with that on the ASX being 55 days (How, 2001). The delay time is required in order for the issue to become fully subscribed and is an indication of investors moving from the uniformed to the informed state.

6.6.3. Experience

A proxy, senior geologist experience, was used to determine the experience of a junior mining company listing on the TSX-V. This seems appropriate as this is the senior "qualified person" as set out in National Instrument 43-101 (NI 43-101) who verifies the mining and exploration geology ("the opportunity").

A statistically insignificant relationship was found between initial abnormal return and geologist experience (EXPERIENCE), as determined by the number of days between the date the qualifying geologist graduated and the date of the IPO. In terms of the multiple regression model a statistically insignificant positive coefficient of EXPERIENCE was found.

A negative co-efficient was expected in that more experience should lead to less *ex ante* uncertainty and therefore less underpricing. The fact that the co-efficient is statistically insignificant means that experience does not relate to the underpricing of junior mining listings on the TSX-V.

How (2001) found a statistically insignificant relationship between geologist reputation and underpricing. Intuitively we are employing a similar proxy in this study, if we assume that geologist experience and reputation are correlated. In other words very experienced geologists should be very successful at identifying mining opportunities

and should therefore have a good reputation. Since How (2001) found no relationship between geologist reputation and underpricing it is perhaps unsurprising that we should find no relationship between geologist experience and underpricing.

Kreuzer, Etheridge & Guj (2007) argue that it is virtually impossible to pick future winners (or losers), and that the success of a new company may simply be linked to capacity of the board and technical team to identify, pursue and realise value from business opportunities. Here success is defined as the long term (>1year) return and not the degree of first day underpricing. Smithson's (2006) study of mining listings on the TSX-V between 1997 - mid 2006 suggests that underpricing is not linked to long term success, with an average underpricing of 38.9% giving way to average negative returns in the second and third year.

Given the arguments above it is suggested that underpricing is in no way related to experience, especially for junior mining companies that have no production and sales capacity.

6.6.4. Stage

Given the arguments regarding this independent variable in the literature review it was proposed that a negative coefficient exists between underpricing and the stage of exploration in that the more advanced the stage the less the *ex ante* uncertainty and hence the lower the degree of underpricing.

A statistically insignificant relationship was found between initial abnormal return and stage (STAGE), as determined by the inverse of the area held in the exploration claim. In terms of the multiple regression model a statistically insignificant negative coefficient of STAGE was found.

To this researcher's knowledge no study of underpricing has used such a proxy to measure stage of exploration, although the findings of the literature review justify its inclusion (Table 1). Cranstoun (2010) in his study of junior gold mining companies listing on various exchanges between 2008 – 2010 concluded that underpricing and independent variables including producing vs. non producing firms (using dummy variables) showed no statistically significant relationship. Our proxy (inverse of the area held) is an interval scale, arguably providing the highest level of measurement precision in determining the stage of exploration (Figure 20). As opposed to Cranstoun's (2010) nominal scale (dummy variables) which may described the end point of our scale (production) and any phase of exploration (no production). It is therefore difficult to relate Cranstoun's (2010) findings to that of this study.

Stage	A	B	C	D	E	F
Lord et al. (2001)	Project generation	Prospect definition	Systematic drilling	Resouce Delineation	Feasibility	Mine
Cranstoun (2010)	Non Producing					Producing
Smithson (2006)	Exploration			Defined Resource		Mine Assets
This Study*						
* Interval scale based on the assumption that 1/(area in exploration claim) describes the stage of development.						

Figure 20: Stage of Development of Mining IPO as Defined by Various Authors

Smithson (2006) in his study of mining listings on the AIM between 1997-mid 2006 concluded that there is no statistical difference in the underpricing of companies that have primary exploration licenses only, vs. companies that have a defined resource (feasibility), vs. companies that have mine assets. Compared to Cranstoun's study this proxy of stage is an ordinal scale and can be mapped onto our interval scale (Figure 20).

Therefore although Smithson's (2006) proxy of stage perhaps lacks the resolution of that used in this study, the findings are consistent with this study - namely that the degree of underpricing is not related to the stage of development. Accordingly this study and that of Cranstoun's (2010) and Smithson's (2006) suggests that the *ex ante* uncertainty of mining listings is not linked to the stage of development.

6.6.5. Conclusions Regarding Independent Variables

Despite justifying their inclusion in an attempt to predict the degree of underpricing none of the factors investigated, or combinations thereof, have been found to correlate with underpricing. Since these independent variables represent firm, issue and market specific factors that have been found to be significant in other studies, this suggests that junior mining companies on the TSX-V may be a special case of mining IPO. This is due to their small size (total capitalisation) and the fact that they are in the early exploration phase. This is in contrast to other exchanges where junior mining listings are more mature with larger capital requirements and much closer to production.

7. CONCLUSION

Although the initial purpose of this research was to determine factors that affect the underpricing of junior platinum mining initial public offerings in a "hot issue" market, it was found that not enough listings involving platinum exploration / mining were conducted in the period of interest (2002-2007). Furthermore a prior art search proved that a hot period did not occur on the TSX-V between 1997-2005. Hence the scope was altered to include all junior mining initial public offerings listed on the TSX-V between 2005-2007.

It was found that underpricing does exist for junior mining initial public offerings listed on the TSX-V between 2005-2007. The degree of underpricing for such listings seems to be constant on the TSX-V, with the average obtained in this study (34.1%) matching those obtained by other researchers investigating different time periods (Smithson, 2006; Koolie & Suret, 2002). The ramification of such a finding means that hot and cold periods do not exist on the TSX-V for junior mining ventures.

Since junior mining IPO's on the TSX-V are on average underpriced by 34-39% this suggests a constant level of the *ex ante* risk. It is therefore speculated that investors do not build in variable *ex ante* market and commodity price risk into the listing price since such listings are still in an exploration phase.

In terms of finding factors that relate to the degree of underpricing: the amount of capital raised, the choice of underwriter and the choice of listing tier category were found to have no effect. This means that investors do not incorporate the *ex ante* risk (in terms of the size of the listing, underwriter reputational effects, and market tier) into the initial pricing of such IPO's.

This behaviour may occur since the size of listings, in terms of capital raised, on the TSX-V is generally small in comparison to other exchanges. This implies that the total *ex ante* risk is fairly high and constant. This explains why such listings have a constant degree of underpricing which is higher than on other exchanges. Furthermore since the listings are small the effect of underwriter reputation is thought to be fairly limited. Finally the difference between the two tiers is considered "marginal" hence it has a negligible impact on the degree of underpricing.

A further four independent variables (market sentiment, listing delay, company experience, and stage of development) were tested to see if they influenced the degree of underpricing by forming a multiple regression model. It was found that such an underpricing predictive model could not be formed since all of the variables were statistically insignificant.

Junior mining IPO's listed on the TSX-V therefore seem to be unique in that typical factors (market sentiment, listing delay, capital raised, and stage of development) that correlate to the degree of underpricing for other junior mining IPO's on other exchanges do not apply to these ventures. The point of difference with junior mining listings on the TSX-V is that they are small in terms of the amount of capital raised, and that they are typically very exploratory in nature. This means that such TSX-V listings have different drivers of *ex ante* risk compared to more "mature" junior mining listings on other exchanges in which such risk may be tied to firm, issue and market factors. Since TSX-V listings are smaller, which already implies high *ex ante* risk, and the full extent of such risk cannot be easily estimated investors expect a higher degree of underpricing. This seems to be the case with TSX-V showing a higher degree of underpricing for such listings compared to other exchanges.

The fact that junior mining IPO's listed on the TSX-V show a constant degree of underpricing over time implies that investors do not build market specific factors (market sentiment and commodity price) into the listing price. Rather investors seem to demand a constant degree of underpricing regardless of the market situation to compensate them for the "unknown" exploration risk.

By contrast an investor with a strategy of holding TSX-V junior mining IPO's for the single listing day should be rewarded with an average return of 34%.

7.1. Future Research Recommendations

This research attempted to determine factors that affect underpricing of junior mining initial public offerings listed on the TSX-V. A time period of 2005-2007 was specified; this therefore restricted the number of new listings in the sampling frame to 127 of which complete information could only be obtained for 50 and of this only 46 remained after the removal of statistical outliers. This is a small fraction of the total number of mining listings on the TSX-V since inception (>1000).

A longer time period is required in order to validate and correlate these findings with a larger sample population. It would be preferable if such a time period spanned through a number of market and commodity cycles in order to try and capture and verify if the hot and cold period does indeed exist.

It was shown that market sentiment, did not correlate with the degree of underpricing. This is despite it successful inclusion in multiple regression models by other researchers (Dimovski & Brooks, 2008; Nguyen *et al.*, 2007). It was speculated that investors on the TSX-V may have taken such market sentiment into account prior to listing, as such this would have to be explored.

The suitability of the experience of the geologist as a proxy for company experience may be called into question. Further studies correlating company experience and such an independent variable are required.

Finally the inverse of the area held in the exploration claim was used as proxy for the stage of mining development. Since this is a novel proxy more work is required in that it could be argued that the area held in the exploration claim may be linked to the type of commodity mined and even the geology. Further research should attempt to ensure that the proxy is suitable at the resource level (fossil fuel, and mining) prior to researching specific commodities (coal, oil, gas, gold, platinum etc.).

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9. APPENDICES

9.1. Appendix 1: Raw Data

Symbol	Company Name	Date of Filing Prospectus	Date of IPO	PiT0 Opening Share Price [Can$]	PiT1 Closing Share Price [Can$]	Total Shares	Rmt Market Return	Area Held in Exploration Claim [hectares]	Geologist Graduating Year	Tier	Options [1=Y, 0=N]	Market Sentiment	Underwriter
GOE	Golden Odyssey Mining Inc	2004-12-01	2005-01-06	0.15	2.2	7000000	0.0012	762	1978-01-01	Tier2	1	0.0059	Leede Financial Markets
RLD	Ripple Lake Diamonds Inc.	2004-09-28	2005-01-07	0.4	5	4000000	0.0105	33392	1971-01-01	Tier2	1	0.1273	Canaccord Capital Corp.
FRA	Franconia Minerals Corporation	2004-10-19	2005-01-12	0.4	3.8	3777500	0.0040	3828	1971-01-01	Tier1	1	0.0784	Claurus Securities Inc.
MFM	Marifil Mines Ltd.	2005-01-05	2005-02-03	0.5	5.4	4599930	-0.0021	5530	1980-01-01	Tier2	1	0.0279	Haywood Securities Inc.
CRZ	Carat Exploration Inc.	2005-03-02	2005-03-14	0.3	7	2000000	-0.0055	4701	1973-01-01	Tier2	1	-0.0140	Canaccord Capital Corp.
BTC	Benton Resources Corp.	2005-03-07	2005-04-13	0.3	3	2300000	-0.0193	4300	1977-01-01	Tier1	1	-0.1311	Canaccord Capital Corp.
MRZ	Mirasol Resources Ltd.	2005-04-08	2005-05-04	0.35	3	5000000	0.0103	19900	1960-01-01	Tier2	1	-0.0895	Haywood Securities Inc
SR	Sutcliffe Resources Ltd. (SR)	2005-05-31	2005-06-27	0.25	3.4	6200000	-0.0033	25300	1985-01-01	Tier2	1	0.0381	Canaccord Capital Corp.
SA	Southern Arc Minerals Inc.	2005-06-03	2005-06-30	0.25	2.9	8000000	0.0068	23650	1980-01-01	Tier2	1	0.0274	Haywood Securities Inc.
GAU	Garrison International Ltd.	2005-06-01	2005-07-11	0.2	1.8	9977500	-0.0024	26500	1967-01-01	Tier2	1	0.0381	Dominick & Dominick Securities Inc.
SGP	Sienna Gold Inc.	2005-06-16	2005-07-15	0.3	7	12000000	0.0060	1000	1969-01-01	Tier2	1	0.0048	First Associates
EDG	Endurance Gold Corporation	2005-05-05	2005-08-04	0.25	2.6	4800000	0.0028	9888	1983-01-01	Tier2	1	0.0852	Haywood Securities Inc.
CBI	Colibri Resource Corporation	2005-07-15	2005-08-05	0.25	2.4	10000000	0.0029	6564	1960-01-01	Tier2	1	0.0644	Canaccord Capital Corp.
NR	Newstrike Resources Ltd.	2005-07-25	2005-08-08	0.4	5	1000000	0.0039	1718	1972-01-01	Tier2	1	0.0375	Jones Gable and Company
SCM	Sacre-Coeur Minerals, Ltd.	2005-10-20	2005-11-07	1.5	14	880000	-0.0001	8810	1966-01-01	Tier1	1	0.0343	Haywood Securities Inc.,
MNV	Mexivada Mining Corp.	2005-10-03	2005-11-30	0.5	5.6	4000000	0.0015	376	1971-01-01	Tier2	1	-0.0574	Haywood Securities Inc
PEM	Premium Exploration Inc	2005-12-13	2006-03-01	0.3	3.6	5000000	0.0115	1798	1985-01-01	Tier2	1	0.1958	Bolder Investment Partners,
CN	Condor Resources Inc	2005-12-28	2006-03-03	0.4	6.8	5000000	0.0151	9800	1963-01-01	Tier2	1	0.2029	Bolder Investment Partners,
AZX	Alexandria Minerals Corporation	2006-02-21	2006-03-24	0.25	2.85	6000000	0.0143	10057	1978-01-01	Tier2	1	0.0789	Bolder Investment Partners,
GU	Global Uranium Corporation	2006-03-09	2006-03-31	0.25	8	2000000	0.0046	5666	1960-01-01	Tier2	1	0.1353	Leede Financial Markets
CGT	Columbus Gold Corporation	2006-03-31	2006-05-24	0.85	10.3	5882352	-0.0321	1719	1984-01-01	Tier2	1	-0.0613	Global Securities
KEX	Kent Exploration Inc.	2006-07-12	2006-08-30	0.2	2.3	6549500	0.0018	707	1971-01-01	Tier2	1	0.0078	Blackmont Capital Inc.
NFR	Northern Freegold Resources Ltd	2006-08-14	2006-09-07	0.5	6.5	6000000	-0.0215	16600	1980-01-01	Tier2	1	0.0520	Blackmont Capital Inc.
WER	Weststar Resources Corp	2006-08-25	2006-09-22	0.25	5	3000000	0.0027	1904	1964-01-01	Tier2	1	-0.0757	Canaccord Capital Corp.
SRD	Strait Gold Corporation	2006-09-29	2006-10-25	0.2	2.6	8000000	0.0142	6800	1980-01-01	Tier2	1	0.0139	Blackmont Capital Inc.
GRR	Golden Reign Resources Ltd	2006-11-03	2006-11-27	0.4	3.9	10000000	0.0042	25000	1970-01-01	Tier2	1	0.0403	Bolder Investment Partners,
RCR	Rockcliff Resources Inc.	2006-11-29	2006-12-18	0.3	4	4000000	0.0029	6336	2002-01-01	Tier 1	1	0.0216	Northern Securities Inc.
CTN	Centurion Minerals Ltd.	2006-11-30	2006-12-22	0.3	8	2500000	0.0092	694	1965-01-01	Tier 2	1	0.0089	Wolverton Securities Ltd.
MD	Midland Exploration Inc	2007-02-23	2007-03-02	0.5	6.3	9000000	-0.0225	15320	1976-01-01	Tier2	1	-0.0505	Desjardins Securities Inc

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GRI	Galore Resources Inc	2007-01-31	2007-03-19	0.4	3.8	6757000	0.0033	48698	1964-01-01	Tier2	1	0.0461	Wolverton Securities Ltd.
SGZ	Sego Resources Inc	2007-02-26	2007-03-27	0.2	3.5	3450000	-0.0021	579	1982-01-01	Tier2	1	-0.0325	Wolverton Securities Ltd.
AEX	Appleton Exploration Inc	2007-04-10	2007-05-14	0.25	3.25	3000000	-0.0107	72890	1980-01-01	Tier2	1	0.0107	Computershare Investor Services Inc
MJO	Mainstream Minerals Corporation	2007-06-01	2007-06-13	0.27	6.6	3703704	-0.0010	1571	1973-01-01	Tier2	0	-0.0452	Wellington West Capital Inc.
ALN	Aldrin Resource Corp	2007-05-22	2007-07-05	0.25	5	5000000	0.0054	4009	1975-01-01	Tier2	1	-0.0152	Canaccord Capital Corp.
ADE	Adex Mining Inc	2007-04-25	2007-07-13	0.3	12.5	30000000	0.0076	405	1983-01-01	Tier1	1	0.0085	Paradigm Capital Inc., and Kingsdale Capital Markets Inc
RPM	Rye Patch Gold Corp	2007-06-22	2007-07-23	0.5	8.9	10000000	-0.0009	3426	1977-01-01	Tier1	1	0.0271	PI Financial Corp.
MER	Meritus Minerals Limited	2007-06-28	2007-09-14	0.25	3.1	6000000	-0.0010	320	1988-01-01	Tier2	1	-0.1208	Global Securities Corporation
AVC	American Vanadium Corp	2007-07-23	2007-09-24	1	15.5	2500000	0.0057	542	1992-01-01	Tier1	1	-0.1470	Haywood Securities Inc
RBV	Ringbolt Ventures Ltd	2007-07-30	2007-10-02	0.25	3.2	2190000	-0.0102	3678	1981-01-01	Tier2	1	-0.1058	Wolverton Securities Ltd.
AGE	Adventure Gold Inc	2007-08-30	2007-10-03	0.25	2	1599600	-0.0013	78	1985-01-01	Tier2	1	0.0981	Desjardins Securities Inc
TXX	Tirex Resources Ltd	2007-10-02	2007-10-19	0.5	11.2	10000000	-0.0122	34400	1966-01-01	Tier2	1	0.0586	Wolverton Securities Ltd.
ADG	Arcus Development Group Inc	2007-09-24	2007-10-23	0.4	5	4160500	0.0132	26136	1984-01-01	Tier2	1	0.0649	Research Capital Corporation.
NPK	Verde Potash PLC	2007-11-13	2007-11-21	1.2	12	13333333	-0.0244	100000	1957-01-01	Tier1	0	-0.0493	Cormark Securities, Dundee Securities, GMP Securities
CVN	Cavan Ventures Inc	2007-11-02	2007-11-26	0.15	3.7	4025000	-0.0245	1308	1970-01-01	Tier2	1	-0.1241	Gateway Securities Inc.
NGM	Northern Gold Mining Inc	2007-11-09	2007-11-27	0.6	3.1	8674649	-0.0201	2208	1958-01-01	Tier2	0	-0.1073	Evergreen Partners Inc
SMN	San Marco Resources Inc	2007-11-02	2007-12-18	0.25	5.5	2500000	-0.0049	534	1964-01-01	Tier2	1	-0.1815	Haywood Securities Inc.
PP	Pacific Potash Corporation	2007-11-21	2007-12-19	0.2	3	4000000	0.0024	5131	1973-01-01	Tier2	1	-0.0712	Wolverton Securities
EAR	Everett Resources Ltd	2007-11-19	2007-12-20	0.34	3.5	3000000	0.0087	6032	1983-01-01	Tier2	1	-0.0808	Canaccord Capital Corp.
GM	GEO Minerals Ltd	2007-11-30	2007-12-21	0.2	2	5000000	0.0241	4988	1972-01-01	Tier2	1	-0.0181	Bolder Investment Partners
FBX	First Bauxite Corporation	2007-11-15	2007-12-10	0.3	9	3000000	0.0076	3725	1973-01-01	Tier2	1	-0.0656	Canaccord Capital Corp.