QUANTIFYING A MINING INVESTABILITY QUOTIENT TO MITIGATE JUNIOR MINING INVESTMENT RISK

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Dedication

It’s impossible to be writing this statement of dedication without the decades of encouragement provided by my friends and family.

My father has been an unparalleled influenced in my geological career. He was always there to dedicate his time to his children. Whether that be clarifying difficult geological topics or just playing baseball with his kids in the street. He has truly set my standard for work ethic.

My mother has given me the strength to progress through adversity through her set example. I always want to dedicate this to my grandparents. They did a wonderful job instilling the moral pillars in my father that I have inherited.

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For life buddy I miss you.

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Abstract

Uncertainty and risk are inherent features of investing in mineral exploration ventures. Investors rely on qualitative and quantitative analysis to evaluate risk of capital. The distinction between risk and uncertainty pertaining to mineral exploration is that risk is an opportunity for loss and uncertainty can be described as the range of probabilities that some condition may occur (Rose, 1987). Stakeholders rely on a combination of investment conferences, risk analysis equations, press releases, financial reports, and investment research to determine if an investment potential. J. M. Cozzolini developed a formula for Risk Adjusted Value (RAV) of an exploration venture. The study resulted in an equation that quantifies potential monetary gain specific to a company (Cozzolini, 1977). Prior equations are over simplified and provide no realistic outputs to rank the potential failure of a mining venture. The Fraser Institute releases an annual report that surveys mining companies that uses databases of sociological, political, and economic surveys to develop a Policy Potential Index (PPI). The PPI identifies risk based on national mineral potential, uncertainty concerning the interpretation of past regulations, uncertainty concerning environmental regulations, political stability, quality of geological databases and other mining pertinent information (Wilson, 2015).

The existent methods can be improved with an equation that incorporates relevant parameters to compare among common class companies. The equation to rank these companies will be called the Mining Investability Quotient (MIQ). The MIQ will assimilate relevant equations, studies and ranking systems from prior studies to assess a mining venture. The quotient parameters are quantified based within financial access, legal authorization, current political system, geologic setting and potential occurrence, environmental preparation, metallurgic details, sociological consensus, and current commodity market trends and conditions.

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Chapter 1: Introduction

Mining

Mining is the extraction of resources through conventional and non-conventional mining methods. We currently mine for metals, gemstones, coal, oil, natural gas, limestone, potash, gravel, clay, and dimensional stone for commercial use. As a species our use of the intrinsic properties of these materials became an integral step in our evolution. Our ability to innovate with these materials and their qualities will continue to drive industries. If it isn't grown, it's mined. The oil, gas and mineral industry sector is the single most robust industry in the world. The top 40 companies in the mining industry own over $1 trillion dollars USD in assets alone as of 2015. ("Www.statista.com, Mar. 2016"). Given this peek into how robust the resource investment business is, we can begin to see the overwhelming task of trying to evaluate mining ventures that have as many variables as a human being. Before we even begin to create a framework to be quantified we need to appreciate the plethora of commodities, markets, and companies, it is easily to see the necessity to separately look at these stocks in small niches.

Mining Companies

There are three basic types of mining companies. Senior producers, Junior producers, and junior explorers (**Table 2.**2). Once we consider the company types and think about how many different commodities are mined, we can understand that most mining companies are restricted to a particular commodity they have experience with. We wouldn't want a copper mining company to be working on a lithium deposit. Now if we consider how many different deposit types there are for similar commodities, we can also understand that we would prefer mining companies that have experience in the specific type of deposit they are exploring. Now that we've started looking at what commodity, and what deposit type, we can look at all the phases from exploration to reclamation. The point of specifically looking at different

commodities, deposit types, and phase involvement of the company allows us to narrow these niches. Something as dynamic as a mining venture requires a lot of filtering and categorization to ensure we are comparing similar companies and deposits. Another category we want to break these into are based on which exchange they are listed. Different exchanges have different requirements of listing and as a result we would like as uniform a reporting style as possible between these companies. Upon discovering the exchange they are listed on, we would want to separate them by market capitalization to make sure we are not comparing a large cap and micro-cap company.

Although in theory we should be able to compare a Junior Gold Miner, that focuses on prospect generation, that trades on the TSX to another one, when we consider the financial magnitude of these companies it is unfair to assess a company that may be delisted upon a bad drilling result and a company that will stay afloat without any reliance on their new exploration project. In simple terms we do not want to compare apples and oranges. For the purpose of this thesis we will be focusing on junior gold miners, doing exploration and development work, trading on the TSX, between Small ($300 Million to $2 Billion Market Capitalization), Micro Capitalization ($50 Million to $300 Million), and Nano Capitalization (<$50 Million) companies at the same phase in the mining process.
(http://www.investopedia.com/articles/basics/03/031703.asp).

Resource Investment

Facing the paramount number of problems associated with mining ventures can seem overwhelming. There are seemingly endless outlets for risk and failure. Investment Advisors and research groups at Casey Research, Dundee Capital Markets, Sprott Inc., and RBC Capital Markets specialize in resource risk investment. They achieve this by learning how to objectively

and comprehensively analyze a mining venture. The term due diligence is used to describe the reasonable steps taken by a person in order to satisfy a legal requirement in buying or selling something.

These resource investment companies learn how to identify the common pitfalls of the mining industry and how to identify what an attractive investment looks like. This is where I first identified the problem with these markets and stock markets in general. The resource investment market is composed of amateurs and professionals. How do small investors begin participating in these markets without knowing anything about science, geology, mining, or business in general? There is no denying that there is a certain excitement and comradery associated with investing with mineral resources and oil and gas. After all it is all based off the binary result of whether or not an economic resource exists but I could not come to terms with the idea that everyone is walking around in some of the most volatile investment types without the proper knowledge of the causations of stock price fluctuations. There was no product that attempted to enlighten the small time investor to normalize the verbiage and keynotes within a feasibility study. There was no aid in understanding what normal industry metrics and standards should be for a certain sized mining venture for a certain type of company.

I sought to create a product that quantifies six suites of metrics that culminate to one final score. A type of checklist that we can cross compare across categorized companies and back test against their market performance. This product, along with every future product will never be able to predict a stock's performance before it happens, but there are ways for us to avoid bad investments through identification of a future snafu.

As Rick Rule, President and CEO of Sprott U.S. Holdings Inc. says, "making money in natural resource venture capital activities, really involves the process of answering an

unanswered question. Many people don't realize this but the natural resource exploration business is very much a research and development business. Answering a series of unanswered questions is what adds value." This is Rick's simple way of saying that the laws of observation and deduction continue to be the driving force behind a good investment. Having the ability and experience to identify what a company tells you versus what you need to know, and then knowing how to get your answer.

One of the most difficult tasks to master within this niche of investment is understanding the inherent volatility of a commodity leveraged market. Imagine being a Junior Gold Exploration company that holds a 1 million proven ounce property in Armenia. Then the value of the resource you are excavating one million ounces of drops from $1,419.60 in May of 2013 to $1,209.88 in June of 2013. In one month your property's Net Present Value (NPV) has virtually lost $200,000,000. When a company' portfolio has an asset that lost $200M, the company's stock will fall. With this in mind, you can understand the goliath importance placed upon identifying your outlook on a particular commodity market. You are going to want to avoid anything you have a negative forecast for, unless you're a contrarian investor (An investment strategy that is characterized by purchasing and selling in contrast to the prevailing sentiment of the time. A contrarian believes that certain crowd behavior among investors can lead to exploitable mispricings in securities markets.)

The next thing we want to take into account when considering a mining venture is its current stage. The risks associated with a mining venture drop as we move closer to the production stage of the venture. I personally look at the overall stage and then fit them according to their most recent published document. I consider the first stage as the exploration

stage. This exploration stage can be broken into three categories. For convenience we will call them E1 through E3.

E1 can be seen as initial exploration/discovery of a resource. We would assume the head exploration geologist has completed a qualitative evaluation of the prospect. The shape, size and mining metrics of the prospect will not be defined yet. This can be known as the speculative stage as it is the riskiest stage that also has the highest potential for returns.

E2 can be expected to have a scoping study along with defined preliminary mining metrics. As this point they may even has a small drilling program with results to put a high uncertainty volumetric calculation to the property. In accordance with TSX listing requirements for a junior mining company in the resource estimate stage, the company will hire a third party consultant without stakes in the company to form a resource estimation for the property.

E3 can be categorized as the Preliminary Economic Assessment (PEA) stage. Once again the company is required to hire a third party consultant to conduct an economic assessment. During the assessment they will attempt to form a NPV for the property. As this point the management team of the property will run sensitives on the NPV and assess whether or not the project will seem attractive enough to start seeking investment to progress.

If the property passes the initial assessment stage and the management team agrees to pursue the project, they will continue assessment of the property with more rigorous reporting and scientific deductions. A1 can be categorized by the starting of the Pre-feasibility Study (PFS). These studies are known to be more detailed than any scoping study or initial exploration reporting. This point in a mining venture is pivotal for the advancement of the project for a number of reasons. First and foremost after the completion of a PFS, the image starts to clear up on whether or not the property warrants an extensive drilling program or new financings. Upon

completion of the PFS mining executives will post their results, which will have a dramatic effect on the stock price of the company (assuming this property is towards the top of their assets.). We would expect the scientific metrics to be within 20-30% accuracy upon completion of the PFS. (De la Vergne, p. 31) Ideally, prior to completion of the PFS the company has already starting their permitting procedures for the nation they are mining in. This is a very important step that tends to be overlooked as the law in every country has different time frames for completion/acceptance of an application. These can range from 2 weeks in very mining friendly countries to 7-10 years in the United States (http://mineralsmakelife.org/assets/images/content/resources/SNL_Exec_Summary.pdf).

The next stage of the assessment is to produce a Feasibility Study (FS). This study is the most detailed report and will determine definitively whether or not the project will continue. This study will become the basis for an actual bankable feasibility study where the mining capital metrics are estimated by a rigorous reporting style that complies with industry regulations for any company listed. One of the largest problem I personally encounter is comparing companies that are listed on multiple exchanges outside of the TSX. The TSX is the premiere junior mining listing exchange as it formed a highly regulated system of reporting results to avoid embellishment for the motive of manipulating thinly traded markets. The FS will provide detailed engineering plans and all of the budgeting metrics for the project. If we were to use an analogy, this is the final business plan before initiating funding for mine construction. We would expect this study to be scientifically accurate between 10-15% where as we expect the cost to be within .5-1% accuracy. (De la Vergne, Jack (2003). Hard Rock Miner's Handbook (PDF). Tempe/North Bay: McIntosh Engineering. pp. 54–65. ISBN 0-9687006-1-6.)

I need to mention that there are no hard and fast rules when it comes to sequencing of reports. There is a known route of reporting within this industry but many times companies will skip or add reports. These projects have so many multi-disciplinary experts reporting such detailed reports that have very specific requirements for posting such information. Along with these reports we do have distinctions made between PFS, FS and a bankable FS. We can have publication of the NI 43-101 in between the PFS and FS assuming they are already listed on an exchange with other projects that pass regulation. When considering an investment with an exploration company we tend to look at the phase of the project as a sizing tool so we can know where this specific company and project stand in the realm of junior mining exploration.

Upon looking at the phase of a project and accounting for specific reporting stage we can begin to look at the asset itself. When determining whether to invest in an industry as risky as the junior mining sector it is important to account for as many parametric suites of quantifiable information as possible. This creates an issue for a multitude of suites that tend to be more qualitative by nature. Luckily this industry is inherently based in a science. One of the most important parameters to consider is the actual geology, geologic setting, deposit type, and quality of the deposit. With a rich history of known deposit types and characteristic mining metrics associated with them, analysts can compare the results of a project to label it on a spectrum of quality. We know what a high grade gold deposit looks like so we can therefore label a new project relative to these known and mapped mines. Upon recognition of the actual geological setting, analysts would look to the actual geographical setting. Within this opens up a large topic since jurisdiction dictates a lot of sociological, environmental, legal, and political regulations.

Proper investments are a balance between tangible and intangible risks. The tangible doesn't lie, it's a pragmatic quantity with an inherent truth. There is a definitive amount of

commodity in the earth and a perfect way to engineer it out. Unfortunately this balance is constantly being affected by the intangible risks. There are influential dynamic changes ranging from tariff legislation of the embodied government to the strength of the elected political party itself. We can see it in the management of the cash and operations within a project. The time needed to properly permit the property based on jurisdiction. All the way down to the sociological agreement with the locals that essentially allow you to operate without problem. The next thing to look at when deciding on an investment is the infrastructure. We would like to know if there is a necessity to spend capital on roads. We look to see if there are local mines around the area that may have lined the region with power and water.

Problem

The problem with modern investors is that they are uninitiated to the components that form a risky or successful venture. There is no database that forms these companies into appropriate classes and normalizes common metrics for comparison. Organizations such as the Fraser Institute focus on non-financial aspects of the mining industry and have developed their own equations for analysis. The Fraser Institute's yearly analysis of are normalized to a 100 point system but do not identify every contribution to a company's success (Wilson, 2015). Mining ventures have influential details that are not considered during a normal risk assessment. This project collects commonly attributable data among a class of miners. Upon collection of these data points we can compare them all on a bell curve knowing their position in the market according to their Valuation of quoted market value.

Chapter 2: Methodology

The methodology to create a quantitative framework that emulates the due diligence of a resource investment broker requires analyses of the aspects they place importance on. Brokers look at financial, geological, metallurgical, market leveraging, sociological, regional, legal, political, and environmental information to evaluate risk. Forming a statistically based framework of these categories requires a sample set of companies to test. As previously stated, to reduce comparison of companies that have inconsistencies we need to narrow our sample set to companies that work with the same commodity, have the same company profile, have the same listing requirements, and are within the same quoted market value class (**Table 2.**5). Using the known performances of these companies as a common denominator, we can compare the performance of their past contributing parameters to see where they land on the bell curve compared to their Market evaluated worth. This is achieved by focusing on eight specific Micro-Cap gold mining juniors between five and eighty-five million dollar quoted market value. Once we know their market value position on the bell curve and back-test their previous data that lead to this position, we can create industry standards for every category of influential parameters. Throughout the Methodology section Vista Gold Corporation will be used a teaching aid. It is difficult to comprehend the verbose explanation of mathematical integration. Once we understand how one company's data points are collected and processed the total comparison process of the eight companies becomes clear.

Not all metrics are created equal. When trying to emulate a successful broker's interpretation of a company's metrics they place different weights on certain categories and then different weight on the metrics that compose the category. Simply said, a broker may find financial data is the most important category. Within the financial category he may think that 'Net Income Before Taxes ($000)' is the most important financial metric. I'm attempting to show the parallel made between a broker's opinion and the formulated MIQ. The broker's

opinion of the category's influence is represented as Ai. A broker's opinion of a particular data point's influence on the category is represented by D_j. For instance, a broker does not consider 'Institutional Ownership (%)' as a highly important metric compared to the company's 'Net Income Before Taxes ($000)'. Therefore we must create a means of applying weighting to the normalized data values.

Equations

The Mining Investability Quotient

$$MIQ\ (X) = \sum_{i=1}^{6} Ai \cdot Si$$

Equation 2.1: The Mining Investability Quotient for company **X** is six term finite sequence represented here in Einstein notation. The equation is composed of six suites of influential parameters (Si). The six suites are individually weighted (Ai) and combined to form the overall score out of one hundred percent. Each contributing suite is composed of individual parameters that possess their own influence to their suite. For instance the financial suite (S_1) has 32 parameters (S_1Q_1-S_1Q_{32}) that contribute to a potential 100% score, and then the financial suite itself has a thirty-five percent influence on the Mining Investability Quotient. Therefore the maximum percent points allowable for the financial suite is thirty-five.

Parameter Suite Scoring Equation

$$S_i = \sum_{j=1}^{n} D_j \cdot f(Q_i)$$

Equation 2.2: The parameter suite scoring equation is a finite sequence determined by the number of parameters contributing the suites overall score. Si is the total percentage awarded to the suite based on the combination of the component parameters. For instance, the financial suite (S_1) will have 32 contributions (S_1Q_1-S_1Q_{32}). Each of the 32 normalized values will be multiplied by their percentage contribution (S_1D_1-S_1D_{32}) to the total suite to form an overall score for the suite. Once 100 percent of the suite is accounted for it will be multiplied by the suite's (S_1) specific percent contribution (A_1) to the MIQ.

MIQ Visualization

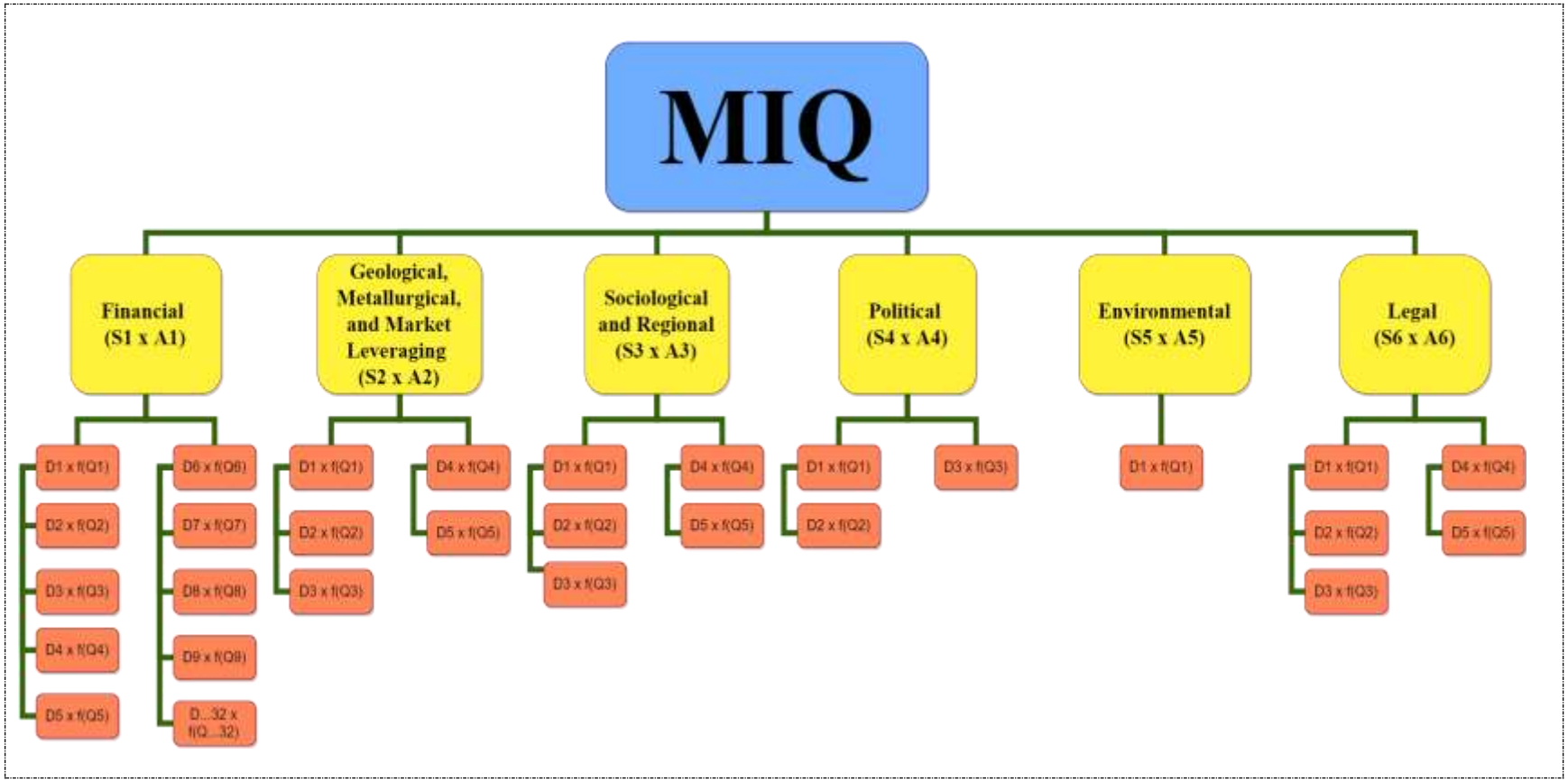

Illustration 1.1: Illustration showing the flow from data points (Qj) to total score (MIQ). 'Qj' is the original data point that has been normalized to the metrics of the company sample set. The data points take on a normalized value between 0 and 1. 'f' if the specific function for that data point. In every case for this experiment it was a positive contribution so f was always equal to 1. 'Dj' is the data point's contribution to the encompassing parameter suite. All of the data points culminate to form 100 percent of parameter suite with 1 being the highest available score. Once the suite is represented between 0 and 1 it is multiplied by its own contribution to the 'MIQ', represented by 'Ai'. All of the parameter suites add up to 100 percent of the 'MIQ' with 1 being the highest available score.

Sample Set Selection Methods

I am using Microsoft Excel to create a framework for data import. Once the data is imported for each company, the framework normalizes the range of values for every data point. The analysis is to be done with an eight company sample set. For consistency we are narrowing these companies based on their commodity (**Table 2.**1), the company type (**Table 2.**2), the listing market (**Table 2.**3), and a range of Quoted Market Value (QMV). In essence this is a filter flowchart towards a niche of companies (**Table 2.**4). Once we have narrowed the companies through these filters we can begin choosing prevalent parameter suites and subsequent data points that contribute to the final score of the suite (**Table 2.**6). It is impractical to compare the financial statements of a Large Capitalization Iron producer that trades on the Australian stock exchange to a Micro Capitalization Junior Gold Exploration company that trades on the Toronto Stock Exchange.

The companies chosen, in decreasing QMV, were Vista Gold Corporation, Heron Resources Incorporated, Golden Minerals Company, Goldgroup Mining Incorporated, Marathon Gold Corporation, Rubicon Minerals Corporation, Fortune Bay Corporation, and Meadow Bay Gold Corp (**Table 2.**5). The listing exchange chosen is the Toronto Stock Exchange (TSX) as they have the most regulated and meticulous listing requirements for Junior Gold mining stocks. We expect companies with a high normalized value of quoted market value to have high normalized value of their data points. The specific scoring methods used for each parameter suite will be detailed in each methodology section.

Table 2.1: Currently Mined Commodities

Aluminum	Copper	Lead	Nickel	Platinum	Silver	Uranium
Antimony	Diamond	Lithium	Niobium	Potash	Tantalum	Vanadium
Chromium	**Gold**	Magnesium	Oil Sands	Rare Earth	Tin	Zinc
Coal	Iridium	Molybdenum	Palladium	Rhodium	Titanium	
Cobalt	Iron Ore	Natural Gas	Phosphates	Ruthenium	Tungsten	

Table 2.2: Gold Mining Company Types

Gold Mining Company Type	**Focus**	**Description**
Senior Producer	Mining and Production	These are large companies that primarily focused on mining for precious and base metals. These companies generally don't explore for gold, so they use up part of their reserves every year. To replenish them, they then buy smaller companies, paying a premium to do so. If the reserves are healthy and management is sound, these companies will do well with rising gold prices. But because things are relatively transparent and predictable, it also limits the returns compared to smaller companies
Junior Producer	Mining, Production, and Exploration	These are intermediate sized companies that primarily focused on mining for precious and base metals. They have revenues and generally strong balance sheets. In addition, they are actively seeking to expand their reserves through exploration and development programs. As they incur costs related to these activities, for which the benefits will occur if they are able to discover greater reserves, they undertake exploration to improve their appeal to investors and enhance their market value. This also makes them attractive takeover targets as the industry seeks consolidations during boom periods.
Junior Explorers	Exploration	These are companies scouring the world in search of the fabled treasure. This is the most speculative end of the spectrum, with high risk and extra-ordinarily high return if the company finds indications of metal mineralization of sufficient potential.

(Moon, p.133 – 141)

Table 2.3: Global Stock exchanges as of December 30 2015

Exchange	Economy	Headquarters
New York Stock Exchange	United States	New York
NASDAQ	United States	New York
London Stock Exchange Group	1-United Kingdom 2-Italy	London
Japan Exchange Group – Tokyo	Japan	Tokyo
Shanghai Stock Exchange	China	Shanghai
Hong Kong Stock Exchange	Hong Kong	Hong Kong
Euronext	European Union	1-Amsterdam
		2-Brussels
		3-Lisbon
		4-London
		5-Paris
Shenzhen Stock Exchange	China	Shenzhen

TMX Group	**Canada**	**Toronto**
Deutsche Börse	Germany	Frankfurt
Bombay Stock Exchange	India	Mumbai
National Stock Exchange of India	India	Mumbai
SIX Swiss Exchange	Switzerland	Zurich
Australian Securities Exchange	Australia	Sydney
Korea Exchange	South Korea	Seoul
OMX Nordic Exchange	Northern Europe, Armenia	Stockholm
JSE Limited	South Africa	Johannesburg
BME Spanish Exchanges	Spain	Madrid
Taiwan Stock Exchange	Taiwan	Taipei
BM&F Bovespa	Brazil	São Paulo

(http://www.world-exchanges.org/statistics/monthly-reports)

Table 2.4: Selection process

Commodity	Company Type	Listing Exchange	Quoted Market Value
Aluminum Antimony Chromium Coal Cobalt Copper Diamond **Gold** Iridium Iron Ore Lead Lithium Magnesium Molybdenum Natural Gas Nickel Niobium Oil Sands Palladium Phosphate Platinum Potash Rare Earth Rhodium Ruthenium Silver Tantalum Tin Titanium Tungsten Uranium Vanadium Zinc	Senior Producer Junior Producer **Junior Explorers**	New York Stock Exchange NASDAQ London Stock Exchange Group Japan Exchange Group – Tokyo Shanghai Stock Exchange Hong Kong Stock Exchange Euronext Shenzhen Stock Exchange **TMX Group** Deutsche Börse Bombay Stock Exchange National Stock Exchange of India SIX Swiss Exchange Australian Securities Exchange Korea Exchange OMX Nordic Exchange JSE Limited BME Spanish Exchanges Taiwan Stock Exchange BM&F Bovespa	**Micro Capitalization ($50 Million to $300 Million)** Small Capitalization ($300 Million to $2 Billion Market Capitalization) Mid Capitalization ($2 Billion to $50 Billion)

Table 2.5: Companies used for sample test set and associated Market Capitalization and normalized position on a bell curve.

Company Name	Market Capitalization ($M)	Normalized Market Cap
Vista Gold Corporation	82.24	98.47%
Heron Resources Incorporated	45.31	71.37%
Golden Minerals Company	41.24	65.11%
Goldgroup Mining Incorporated	29.55	45.33%
Marathon Gold Corporation	29.34	44.97%
Rubicon Minerals Corporation	15.4	23.29%
Fortune Bay Corporation	8.72	15.43%
Meadow Bay Gold Corp	6.31	13.08%

Table 2.6: Parameter Suites of influential quantifiable data points

Suite (S_i)	Data Points (Q_j)
Financial Metrics **S_1**	Market Capitalization Net Income before Taxes Cash Flow: Depreciation and Amortization EBITDA EBITDA/ Interest Expense EBITDA before Capital Expense/ Interest Expense Price/Book (%) Institutional Ownership (%) Number of Institutions Current Assets Working Capital Total Assets Tangible Assets Total Equity Total Capitalization, at Book Value Operating Revenue, Net Net Operating Profit After Tax Net Income Cash Flow from Operating Activities Cash Flow from Investing Activities Net Free Cash Flow Total Equity/ Total Assets Total Debt/ Total Equity (x)

	Long-term Debt/ Book Capital Net Free Cash Flow Yield ROAA ROAE ROACE Return on Invested Capital Operating Revenue Growth EBITDA/ Share Basic EPS after Extra
Geological, Metallurgical, and Market Leveraging **Metrics** **S_2**	After Tax Lower Limit Discount Rate Gold Leveraging Slope After Tax Lower Limit Discount Rate Drop Dead Price Slope Mineral Potential, Assuming Current Regulation / Land Use Restrictions Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime) Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)
Sociological and Regional Metrics **S_3**	Security (includes physical security due to the threat of attack by terrorists, criminals, guerrilla groups, etc.) Availability of Labor and Skills Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites Quality of Infrastructure (includes access to roads, power availability, etc.) Socioeconomic Agreements/Community
Political Metrics **S_4**	Political Stability Trade Barriers—tariff and non-tariff barriers; restrictions on profit repatriation, currency restrictions, etc. Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)
Environmental Metrics **S_5**	Uncertainty Concerning Environmental Regulations
Legal Metrics **S_6**	Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc.,)

	Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.) Uncertainty Concerning Disputed Land Claims Labor Regulations/Employment Agreements and Labor Militancy/Work Disruptions

RAW and MIQ Weighting Contribution Methods

To show significance in the self-created weightings of influence from each parameter suite we need to have a controlled weighting to compare to the MIQ weighting. They are called RAW and MIQ. RAW uses the raw values of every data point's normalized value (Qj) and creates an equal influence framework for the total RAW Score. RAW takes all data points within a parameter suite and places an equal contribution percentage (Dj) for every data point (Qj). No Data point (Qj) is more or less important than the other within the parameter suite. Each parameter suite then contributes one-sixth of the total RAW as there are 6 parameter suites (**Table 2.**7). The MIQ uses the same normalized data set the values of every data point's normalized value and creates an unequal framework for individual data point contribution weights (Dj) and total parameter suite contribution weights (Ai) for the total MIQ (**Table 2.**8).

Table 2.7: Parameter Suites of influential quantifiable data points with RAW defined contribution percentages

Parameter Suite	**Parameter Suite Contribution Percentage (Ai) to RAW**	**Data Points**	**Data Point Contribution Percentage (Dj) to the Parameter Suite**
Financial Metrics	16.67%	Market Capitalization	3.13%
		Net Income before Taxes	3.13%
		Cash Flow: Depreciation and Amortization	3.13%
		EBITDA	3.13%
		EBITDA/ Interest Expense	3.13%
		EBITDA before Capital Expense/ Interest Expens	3.13%
		Price/Book (%)	3.13%
		Institutional Ownership (%)	3.13%
		Number of Institutions	3.13%
		Current Assets	3.13%
		Working Capital	3.13%
		Total Assets	3.13%
		Tangible Assets	3.13%
		Total Equity	3.13%
		Total Capitalization, at Book Value	3.13%
		Operating Revenue, Net	3.13%

		Net Operating Profit After Tax	3.13%
		Net Income	3.13%
		Cash Flow from Operating Activities	3.13%
		Cash Flow from Investing Activities	3.13%
		Net Free Cash Flow	3.13%
		Total Equity/ Total Assets	3.13%
		Total Debt/ Total Equity (x)	3.13%
		Long-term Debt/ Book Capital	3.13%
		Net Free Cash Flow Yield	3.13%
		ROAA	3.13%
		ROAE	3.13%
		ROACE	3.13%
		Return on Invested Capital	3.13%
		Operating Revenue Growth	3.13%
		EBITDA/ Share	3.13%
		Basic EPS after Extra	3.13%
Geological, Metallurgical, and Market Leveraging Metrics	16.67%	After Tax Lower Limit Discount Rate Gold Leveraging Slope	20%
		After Tax Lower Limit Discount Rate Drop Dead Price Slope	20%
		Mineral Potential, Assuming Current Regulation / Land Use Restrictions	20%
		Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime)	20%
		Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)	20%
Sociological and Regional Metrics	16.67%	Security (includes physical security due to the threat of attack by terrorists, criminals, guerrilla groups, etc.)	20%
		Availability of Labor and Skills	20%
		Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites	20%
		Quality of Infrastructure (includes access to roads, power availability, etc.)	20%
		Socioeconomic Agreements/Community	20%

Political Metrics	16.67%	Political Stability Trade Barriers—tariff and non-tariff barriers; restrictions on profit repatriation, currency restrictions, etc. Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)	33.33% 33.33% 33.33%
Environmental Metrics	16.67%	Uncertainty Concerning Environmental Regulations	100%
Legal Metrics	16.67%	Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc.,) Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.) Uncertainty Concerning Disputed Land Claims Labor Regulations/Employment Agreements and Labor Militancy/Work Disruptions	20% 20% 20% 20% 20%

Table 2.8: Parameter Suites of influential quantifiable data points with MIQ defined contribution percentages for Ai and Dj

Parameter Suite	**Parameter Suite Contribution Percentage (Ai) to MIQ**	**Data Points**	**Data Point Contribution Percentage (Dj) to the Parameter Suite**
Financial Metrics	35%	Net Income before Taxes	15%
		Cash Flow: Depreciation and Amortization	9%
		EBITDA	1%
		EBITDA/ Interest Expense	5%
		EBITDA before Capital Expense/ Interest Expense	1%
		Price/Book (%)	1%
		Institutional Ownership (%)	1%
		Number of Institutions	1%
		Current Assets	1%
		Working Capital	2%
		Total Assets	3%

		Tangible Assets	5%
		Total Equity	1%
		Total Capitalization, at Book Value	1%
		Operating Revenue, Net	1%
		Net Operating Profit After Tax	3%
		Net Income	1%
		Cash Flow from Operating Activities	2%
		Cash Flow from Investing Activities	2%
		Net Free Cash Flow	1%
		Total Equity/ Total Assets	10%
		Total Debt/ Total Equity (x)	1%
		Net Free Cash Flow Yield	1%
		ROAA	1%
		ROAE	5%
		ROACE	5%
		Return on Invested Capital	5%
		Operating Revenue Growth	2%
		EBITDA/ Share	5%
		Basic EPS after Extra	5%
Geological, Metallurgical, and Market Leveraging Metrics	30%	After Tax Lower Limit Discount Rate Gold Leveraging Slope	20%
		After Tax Lower Limit Discount Rate Drop Dead Price Slope	50%
		Mineral Potential, Assuming Current Regulation / Land Use Restrictions	10%
		Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime)	10%
		Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)	10%
Sociological and Regional Metrics	10%	Security (includes physical security due to the threat of attack by terrorists, criminals, guerrilla groups, etc.)	40%
		Availability of Labor and Skills	10%
		Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites	10%
		Quality of Infrastructure (includes access to roads, power availability, etc.)	25%
		Socioeconomic Agreements/Community	15%
Political Metrics	10%	Political Stability	60%
		Trade Barriers—tariff and non-tariff barriers; restrictions on profit repatriation, currency restrictions, etc.	20%
		Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)	20%

Environmental Metrics	5%	Uncertainty Concerning Environmental Regulations	100%
Legal Metrics	10%	Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations	20%
		Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc.,)	20%
		Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.)	20%
		Uncertainty Concerning Disputed Land Claims	20%
		Labor Regulations/Employment Agreements and Labor Militancy/Work Disruptions	20%

Data Processing Methods:

Statistical Method

Every suite and every data point has the same statistical processing method. We are placing a range of values on a bell curve to appoint a normalized value between 0 and 1. It is imperative to understand that every data point Qj has a score between 0 and 1. The principal task becomes processing the raw data to be sized to a normal bell curve. There are three basic raw data sources for this experiment. Each data source has its own processing method to arrive to a processed data set. Once we have a range of values in the processed data set for each company we can then normalize the values to derive the starting data point Q_j. The raw data sources used for all parameter suites were SNL Metals Financial data, The Fraser Institute's survey data, and published reports by each mining company for geological data.

SNL Metals Data Processing Method

SNL Metals provides users with up to date financial data about mining companies. All publically traded mining companies on the TSX are required to submit financial reports for public access (Appendix A). SNL maintains a database of all filed reports for easy data retrieval. Financial details were selected for each company between the years 2012 and 2016. We use these commonly reported financial metrics to normalize the trend of the values through time. This is achieved by collaborating data from balance sheets, financial statements, debt ratios, and basic financial ratios used for company health assessments. We know a company's position of valuation based on Quoted Market Value, now we want to see if their financial metrics (S_1Q_1 – S_1Q_{32}) align with their market performance. I chose 32 financial metrics that are consistently reported (**Table 2.**5). We are not as concerned with the magnitude of the numbers as much as the trends of the numbers. One denominating factor among this industry is that they are all leveraged on the price of gold. When the price of gold crashed, it crashed for all the gold miners. As a result when we observe facets like 'Net Income before Taxes', we are less concerned with whether or not the company had negative earnings, but more concerned with whether or not they

have been improving during this gold depression. As a result, all of the normalized values used in the financial parameter suites are based on the slope of the reported values between 2012 of 2016 (**Table 2.**9).

Table 2.9: Example of financial data points reduced to slope data. Table showing data for the financial metric 'Net Period before taxes ($000)' between 2012 and the first quarter of 2016. The slope created by this metric through time becomes the first processed data point to become normalized among its peer's slopes.

Vista Gold Corporation						**Slope of Last 4 Years and YTD**
Reporting Period	**2012**	**2013**	**2014**	**2015**	**2016 Q1**	
Net Income before Taxes **($000)**	-90,803	-74,861	-18,926	1,011	-714	25605.00

Table 2.10: Creating Normalized values from slope data. Once we record the slopes for all 8 company's 'Slope of Last 4 Years and YTD of 'Net Income Before Taxes ($000)' and define a standard, we use statistical normalization methods to define it's normalized value and in turn each company's first data point (Q1).

Company	**Slope of Last 4 Years and YTD of 'Net Income Before Taxes ($000)'**	**Normalized value for S_1Q_1**
Vista Gold Corporation	25605.00	82.02%
Heron Resources Incorporated	1659.60	37.26%
Golden Minerals Company	45218.70	97.34%
Goldgroup Mining Incorporated	-715.80	32.70%
Marathon Gold Corporation	510.90	35.03%
Rubicon Minerals Corporation	-23876.10	4.96%
Fortune Bay Corporation	14396.10	63.12%
Meadow Bay Gold Corp	646.70	35.29%

This slope analysis and normalization is performed for all 32 financial data points (S_1Q_1 – S_1Q_{32}) that will be details in the 'Financial Analysis Method' section.

Fraser Data Processing Method

The Fraser Institute is a mining industry questionnaire with a total of 449 responses by mining management teams. Fraser's questionnaire asks the surveyor to rank categories for the jurisdiction they are currently working on between 1 and 5. 1 represents "Not a deterrent from investment" where 5 represent a "strong deterrent from investment." Each category's answers between 1 and 5 are reported for 109 jurisdictions. The data from the Fraser institute is used in every parameter suite except Financial (S_1). Once I have the raw data for each jurisdiction I applied my own processing method. When someone answer a survey between 1 and 5 there is a certain confidence associated with a response. I only accounted for the top and bottom 2 values. For instance if a company is working in Alberta and is asked to rank the 'Mineral Potential, Assuming Current Regulation / Land Use Restrictions' between 1 and 5, I only accounted for the companies that think it is not a deterrent or is a deterrent. I added the number of responses for 1 and 2 and subtracted the number of 4 and 5 responses. I disregarded all 3s as these answers tend to be of no opinion. We can use Vista Gold Corp's Mt. Todd property as an example of Fraser data used. Mt. Todd is in the Northern Territory, Australia jurisdiction. All topics asked to be ranked are detailed in Table (2.11).

Table 2.11: Topics asked to be ranked for every jurisdiction in Fraser's questionnaire

Mineral Potential, Assuming Current Regulation / Land Use Restrictions
Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime)
Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations
Uncertainty Concerning Environmental Regulations
Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc,)
Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.)
Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)
Uncertainty Concerning Disputed Land Claims
Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites

Quality of Infrastructure (includes access to roads, power availability, etc.)
Socioeconomic Agreements/Community
Trade Barriers—tariff and non-tariff barriers; restrictions on profit repatriation, currency restrictions, etc.
Political Stability
Labor Regulations/Employment Agreements and Labour Militancy/Work Disruptions
Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)
Security (includes physical security due to the threat of attack by terrorists, criminals, guerrila groups, etc.)
Availability of Labor and Skills

Table 2.12: Fraser survey data for Australia's Northern Territory's 'Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)' Table showing a category to be ranked by management teams in the Northern Territory of Australia. 68% of surveyors said that the Quality of the Geological Database in not a deterrent to investment where 32% said it is a minor deterrent.

	Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)				
Investment Deterrent (Low to High)	1	2	3	4	5
Northern Territory, Australia	68%	32%	0%	0%	0%

The 1 and 2 responses are positive responses on the survey topic for the jurisdiction where the 4 and 5 responses are negative. Once we have the raw data a processed 'total score' is derived by subtracting the negative responses from the positive ones (**Table 2.**14).

Table 2.13: Processing method to achieve a total from survey data Table showing the method to create a total score awarded to a jurisdiction by subtracting the total negative responses from the total positive ones.

	Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)
Total Positive Responses (Sum of 1 and 2)	100%
Total Negative Responses (Sum of 4 and 5)	0%
Total score (Total Positive Reponses - Total Negative responses)	100%

As a result the range of values for the processed data is between -1 and 1. Once every jurisdiction's total processed score is collected for a category we have a range of data specific to jurisdiction. This dataset can then be normalized to create usable data points for Q_j.

Table 2.14: Table showing the full sample set for the 'Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)' survey question proposed by Fraser. Once we use the refinement methods discussed in **Table 2.**13 and 2.14 we are left with total scores between -1 and 1. Using this average and standard deviation of these totals we can produce a normalized value that will be used for it's associated Q_j.

Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)							
	1	2	3	4	5	Total	Normalized
Alberta	0.58	0.35	0.06	0	0	0.93	96.24%
British Columbia	0.65	0.31	0.04	0	0	0.96	97.85%
Manitoba	0.45	0.52	0.03	0	0	0.97	98.39%
New Brunswick	0.43	0.57	0	0	0	1	100.00%
Newfoundland and Labrador	0.63	0.33	0.05	0	0	0.96	97.85%
Northwest Territories	0.37	0.43	0.15	0.02	0.02	0.76	87.10%
Nova Scotia	0.38	0.5	0.06	0.06	0	0.82	90.32%
Nunavut	0.27	0.49	0.17	0.07	0	0.69	83.33%
Ontario	0.54	0.46	0	0	0	1	100.00%
Quebec	0.63	0.33	0.04	0	0	0.96	97.85%
Saskatchewan	0.62	0.36	0.03	0	0	0.98	98.92%
Yukon	0.51	0.44	0.03	0.02	0	0.93	96.24%
Alaska	0.49	0.4	0.09	0.02	0	0.87	93.01%
Arizona	0.59	0.35	0.06	0	0	0.94	96.77%
California	0.29	0.48	0.1	0.1	0.03	0.64	80.65%
Colorado	0.5	0.34	0.11	0.03	0.03	0.78	88.17%
Idaho	0.49	0.37	0.14	0	0	0.86	92.47%
Michigan	0.27	0.73	0	0	0	1	100.00%
Minnesota	0.69	0.23	0.08	0	0	0.92	95.70%
Montana	0.47	0.4	0.1	0.03	0	0.84	91.40%
Nevada	0.52	0.35	0.08	0.04	0.01	0.82	90.32%
New Mexico	0.46	0.46	0.04	0.04	0	0.88	93.55%
Utah	0.39	0.45	0.06	0.06	0.03	0.75	86.56%
Washington	0.4	0.48	0.08	0.04	0	0.84	91.40%
Wyoming	0.5	0.42	0.04	0.04	0	0.88	93.55%
New South Wales	0.62	0.32	0.06	0	0	0.94	96.77%
Northern Territory	0.68	0.32	0	0	0	1	100.00%
Queensland	0.62	0.36	0.02	0	0	0.98	98.92%
South Australia	0.85	0.13	0.02	0	0	0.98	98.92%
Tasmania	0.67	0.33	0	0	0	1	100.00%
Victoria	0.5	0.36	0.07	0.07	0	0.79	88.71%
Western Australia	0.76	0.24	0	0	0	1	100.00%
Fiji	0.12	0.24	0.47	0.18	0	0.18	55.91%
Indonesia	0.07	0.27	0.53	0.13	0	0.21	57.53%

Malaysia	0	0.6	0.2	0.2	0	0.4	67.74%
New Caledonia	0.33	0.33	0.33	0	0	0.66	81.72%
New Zealand	0.4	0.48	0.12	0	0	0.88	93.55%
Papua New Guinea	0	0.32	0.45	0.23	0	0.09	51.08%
Philippines	0	0.24	0.65	0.12	0	0.12	52.69%
Solomon Islands	0	0.5	0.38	0	0.13	0.37	66.13%
Angola	0	0.13	0.5	0.38	0	-0.25	32.80%
Botswana	0.1	0.6	0.25	0.05	0	0.65	81.18%
Burkina Faso	0	0.5	0.39	0.11	0	0.39	67.20%
Democratic Republic of Congo (DRC)	0	0.18	0.59	0.18	0.05	-0.05	43.55%
Eritrea	0	0.57	0.29	0.14	0	0.43	69.35%
Ethiopia	0	0.44	0.44	0.11	0	0.33	63.98%
Ghana	0.05	0.59	0.32	0.05	0	0.59	77.96%
Guinea(Conakry)	0	0.18	0.36	0.36	0.09	-0.27	31.72%
Ivory Coast	0	0.25	0.63	0.13	0	0.12	52.69%
Kenya	0	0.22	0.56	0.22	0	0	46.24%
Madagascar	0.1	0.3	0.2	0.4	0	0	46.24%
Mali	0	0.48	0.29	0.19	0.05	0.24	59.14%
Morocco	0	0.5	0.5	0	0	0.5	73.12%
Mozambique	0	0.33	0.33	0.33	0	0	46.24%
Namibia	0.33	0.48	0.11	0.07	0	0.74	86.02%
Niger	0	0	0.14	0.86	0	-0.86	0.00%
South Africa	0.18	0.45	0.33	0.03	0	0.6	78.49%
Tanzania	0.09	0.48	0.39	0.04	0	0.53	74.73%
Zambia	0.04	0.56	0.32	0.08	0	0.52	74.19%
Zimbabwe	0	0.26	0.32	0.32	0.11	-0.17	37.10%
Catamarca	0.09	0.18	0.27	0.36	0.09	-0.18	36.56%
Chubut	0.08	0.23	0.38	0.23	0.08	0	46.24%
Jujuy	0.08	0.25	0.33	0.17	0.17	-0.01	45.70%
La Rioja	0	0.33	0.22	0.22	0.22	-0.11	40.32%
Mendoza	0	0.48	0.33	0.1	0.1	0.28	61.29%
Neuquen	0	0.5	0.17	0.17	0.17	0.16	54.84%
Rio Negro	0	0.29	0.14	0.43	0.14	-0.28	31.18%
Salta	0.12	0.35	0.29	0.18	0.06	0.23	58.60%
San Juan	0.06	0.35	0.41	0.06	0.12	0.23	58.60%
Santa Cruz	0.06	0.31	0.38	0.19	0.06	0.12	52.69%
Bolivia	0.05	0.24	0.48	0.24	0	0.05	48.92%
Brazil	0.03	0.44	0.47	0.06	0	0.41	68.28%
Chile	0.31	0.58	0.12	0	0	0.89	94.09%
Colombia	0.09	0.44	0.28	0.13	0.06	0.34	64.52%
Dominican Republic	0.13	0.13	0.63	0.13	0	0.13	53.23%

Ecuador	0.03	0.43	0.3	0.23	0	0.23	58.60%
French Guiana	0.29	0.29	0.29	0.14	0	0.44	69.89%
Guatemala	0.1	0.4	0.1	0.4	0	0.1	51.61%
Guyana	0	0.1	0.4	0.5	0	-0.4	24.73%
Honduras	0	0.18	0.36	0.45	0	-0.27	31.72%
Mexico	0.35	0.44	0.19	0.02	0	0.77	87.63%
Nicaragua	0	0.33	0.42	0.25	0	0.08	50.54%
Panama	0.13	0.2	0.53	0.07	0.07	0.19	56.45%
Peru	0.31	0.5	0.19	0	0	0.81	89.78%
Uruguay	0	0.29	0.71	0	0	0.29	61.83%
Venezuela	0	0.27	0.2	0.27	0.27	-0.27	31.72%
China	0	0.2	0.33	0.47	0	-0.27	31.72%
India	0	0.46	0.31	0.23	0	0.23	58.60%
Kazakhstan	0.14	0.43	0.43	0	0	0.57	76.88%
Kyrgyzstan	0	0.29	0.43	0.29	0	0	46.24%
Laos	0	0.13	0.88	0	0	0.13	53.23%
Mongolia	0	0.35	0.35	0.29	0	0.06	49.46%
Myanmar	0	0	0.4	0.4	0.2	-0.6	13.98%
Vietnam	0.17	0	0.33	0.5	0	-0.33	28.49%
Bulgaria	0.25	0.38	0.38	0	0	0.63	80.11%
Finland	0.78	0.22	0	0	0	1	100.00%
France	0.46	0.31	0.23	0	0	0.77	87.63%
Greenland	0.47	0.4	0.13	0	0	0.87	93.01%
Greece	0.09	0.45	0.27	0.18	0	0.36	65.59%
Ireland	0.79	0.17	0.04	0	0	0.96	97.85%
Norway	0.58	0.33	0.08	0	0	0.91	95.16%
Poland	0.25	0.25	0.5	0	0	0.5	73.12%
Portugal	0.29	0.57	0.14	0	0	0.86	92.47%
Romania	0	0.44	0.44	0.11	0	0.33	63.98%
Russia	0	0.42	0.42	0.17	0	0.25	59.68%
Serbia	0.17	0.33	0.5	0	0	0.5	73.12%
Spain	0.3	0.5	0.2	0	0	0.8	89.25%
Sweden	0.78	0.22	0	0	0	1	100.00%
Turkey	0.05	0.55	0.32	0.09	0	0.51	73.66%

Company Mining Report Processing Method

Unlike the financial parameter suite that has a uniform metrics reported on balance sheets and published financial documents, corporate documents entailing geological, metallurgical, and market relevant information are inconsistent between properties. The task becomes finding

commonalities within geological, metallurgical, and market data relevant to the properties in the company's portfolio.

In order to establish a framework we are going to normalize and compare each company's flagship property. One might note that something as dynamic as a mining venture has a plethora of data points relevant to the success and failure of a prospect. This includes aspects of grade, inferred, indicated, and measured tonnes of ore, stockpiles, strip ratios, metallurgical processing methods, recovery, the price movement of the commodity and every other detail that act as catalysts for the value of the in-situ metal. One can begin to wonder how we would ever compare every company's properties knowing that it has so many influential switches. Luckily what we are looking for in the property can be boiled down to one metric known as the Net Present Value (NPV). NPV is described as:

> The difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of a projected investment or project. A positive net present value indicates that the projected earnings generated by a project or investment (in present dollars) exceeds the anticipated costs (also in present dollars). Generally, an investment with a positive NPV will be a profitable one and one with a negative NPV will result in a net loss. This concept is the basis for the Net Present Value Rule, which dictates that the only investments that should be made are those with positive NPV values.

("Net Present Value (NPV) Definition | Investopedia." Investopedia. N.p., 2003. Web. 06 July 2016.)

Given ample information a company can create a NPV of a property based on different sensitivities of gold price and discounted future cash. It is an industry standard to have a third party finance firm derive a professional NPV calculation for projects near the Pre-Feasibility and Feasibility stages. This is what allows us to size each specific mining venture to a comparable metric. Instead of trying to analyze where every single metric falls on a bell curve amongst its peers, we use the NPV calculation to derive sensitivity slopes of discounted cash and gold price. In the same way that our financial metrics are based off of slopes of past performance, we want to analyze sensitivity slopes of each company's flagship property. If we are given two NPVs of a property with different gold prices, we can create a leveraging slope of for the properties (Illustration 2.1). Using the data we can deduce two important metrics based on geological, metallurgical, and market details. I identify which flagship properties benefit the most from upward gold movement based on slope values. This becomes the first data point (S_2Q_1) to be normalized for comparison within the Geological parameter suite (**Table 2.**11). Companies that do not have enough data to produce a line are excluded. They miss out on all potential points achieved by S_2Q_1 and S_2Q_2 by not providing the industry standard of NPV analysis. We derive the second data point (S_2Q_2) based on the x-intercept. S_2Q_2 is known as the Drop Dead Price. This metric represents the price of gold per ounce that renders the property worthless (**Table 2.**12).

Net Present Value vs. Gold Price

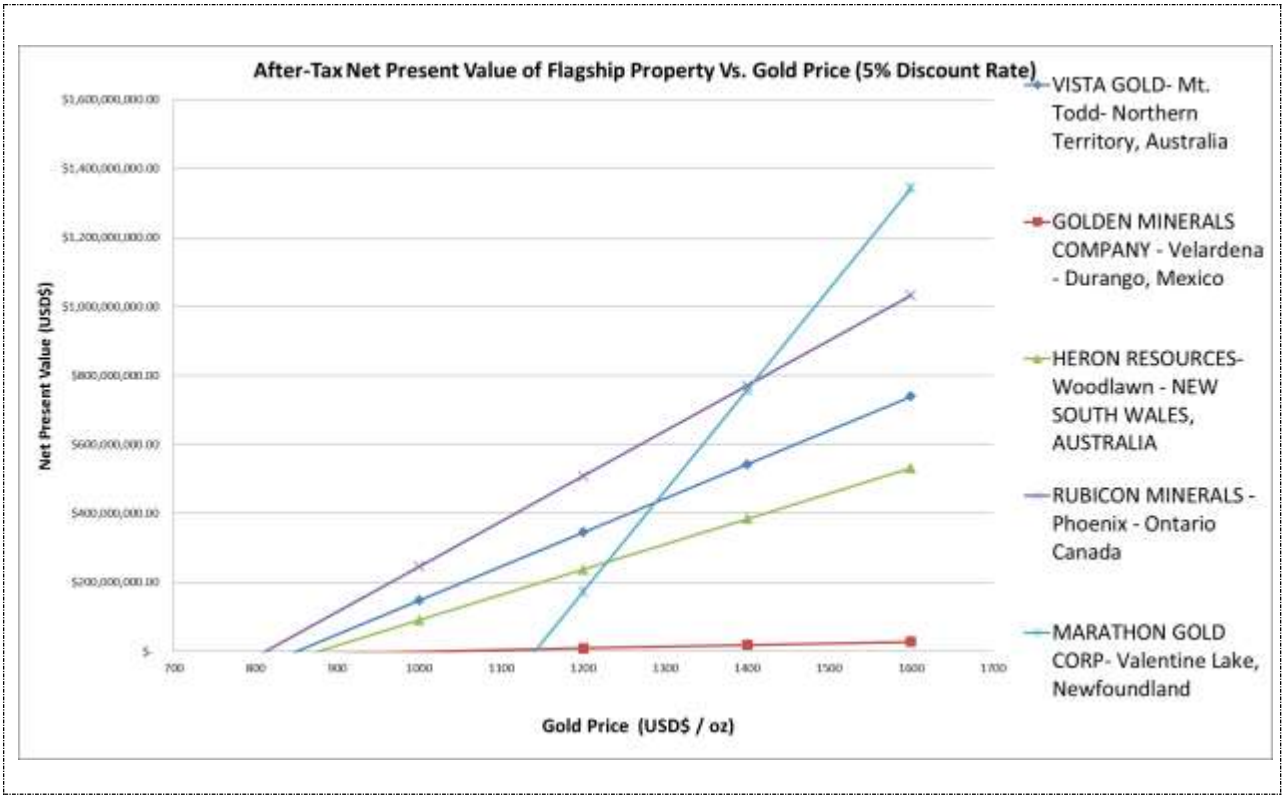

Illustration 2.1: Graph showing the sensitivity of each flagship property's Net Present Value based on gold price movements. The slope of each property's net present value becomes S_2Q_1 once it is normalized while the X-Intercept becomes S_2Q_2 upon normalization.

Table 2.15: Creating Normalized values from Gold Price Leveraging Slope data

Company	Gold Price Leveraging Slope	Normalized value for S_2Q_1
Vista Gold Corporation	985,572.63	42.42%
Heron Resources Incorporated	734,800.00	32.51%
Golden Minerals Company	48,000.00	12.06%
Marathon Gold Corporation	2,926,086.96	96.71%
Rubicon Minerals Corporation	1,146,427.98	49.09%

Table 2.16: Creating Normalized values from Drop Dead Price data

Company	Drop Dead Price at 5% Discount Rate	Normalized value for S_2Q_2
Vista Gold Corporation	$ 849.86	85.59%
Heron Resources Incorporated	$ 876.66	79.07%
Golden Minerals Company	$ 1,015.97	30.59%
Marathon Gold Corporation	$ 1,141.02	4.56%

Rubicon Minerals Corporation	$	927.81	75.83%

Data Sources, Data Point, and Variable Definition

$$S_1 = \sum_{j=1}^{32} D_j \cdot f(Q_j)$$

Equation 2.3: Financial suite notation definition

Table 2.17: MIQ Financial Suite weighting and definition

Parameter Suite Definition	Parameter Suite Designation	Parameter Suite Weighting Designation	Parameter Suite Weighting Value
Financial	S_1	A_1	0.35

Table 2.18: MIQ Financial data point weighting and definition

Data Source	Data Point Definition	Data Point Designation	Data Point Weighting Designation	Data Point Weighting Value
SNL Metals	Market Capitalization	S_1Q_1	S_1D_1	0.15
SNL Metals	Net Income before Taxes	S_1Q_2	S_1D_2	0.09
SNL Metals	Cash Flow: Depreciation and Amortization	S_1Q_3	S_1D_3	0.01
SNL Metals	EBITDA	S_1Q_4	S_1D_4	0.05
SNL Metals	EBITDA/ Interest Expense	S_1Q_5	S_1D_5	0.01
SNL Metals	EBITDA before Capital Expense/ Interest Expense	S_1Q_6	S_1D_6	0.01
SNL Metals	Price/Book (%)	S_1Q_7	S_1D_7	0.01
SNL Metals	Institutional Ownership (%)	S_1Q_8	S_1D_8	0.01
SNL Metals	Number of Institutions	S_1Q_9	S_1D_9	0.01
SNL Metals	Current Assets	S_1Q_{10}	S_1D_{10}	0.01
SNL Metals	Working Capital	S_1Q_{11}	S_1D_{11}	0.03
SNL Metals	Total Assets	S_1Q_{12}	S_1D_{12}	0.05
SNL Metals	Tangible Assets	S_1Q_{13}	S_1D_{13}	0.01
SNL Metals	Total Equity	S_1Q_{14}	S_1D_{14}	0.01
SNL Metals	Total Capitalization, at Book Value	S_1Q_{15}	S_1D_{15}	0.01

SNL Metals	Operating Revenue, Net	S_1Q_{16}	S_1D_{16}	0.03
SNL Metals	Net Operating Profit After Tax	S_1Q_{17}	S_1D_{17}	0.01
SNL Metals	Net Income	S_1Q_{18}	S_1D_{18}	0.02
SNL Metals	Cash Flow from Operating Activities	S_1Q_{19}	S_1D_{19}	0.02
SNL Metals	Cash Flow from Investing Activities	S_1Q_{20}	S_1D_{20}	0.01
SNL Metals	Net Free Cash Flow	S_1Q_{21}	S_1D_{21}	0.1
SNL Metals	Total Equity/ Total Assets	S_1Q_{22}	S_1D_{22}	0.01
SNL Metals	Total Debt/ Total Equity (x)	S_1Q_{23}	S_1D_{23}	0.03
SNL Metals	Long-term Debt/ Book Capital	S_1Q_{24}	S_1D_{24}	0.01
SNL Metals	Net Free Cash Flow Yield	S_1Q_{25}	S_1D_{25}	0.01
SNL Metals	ROAA	S_1Q_{26}	S_1D_{26}	0.05
SNL Metals	ROAE	S_1Q_{27}	S_1D_{27}	0.05
SNL Metals	ROACE	S_1Q_{28}	S_1D_{28}	0.05
SNL Metals	Return on Invested Capital	S_1Q_{29}	S_1D_{29}	0.01
SNL Metals	Operating Revenue Growth	S_1Q_{30}	S_1D_{30}	0.02
SNL Metals	EBITDA/ Share	S_1Q_{31}	S_1D_{31}	0.05
SNL Metals	Basic EPS after Extra	S_1Q_{32}	S_1D_{32}	0.05

Geological, Metallurgical, and Market Leveraging Analysis Methods

$$S_2 = \sum_{j=1}^{5} D_i \cdot f(Q_i)$$

Equation 2.4: Geological, Metallurgical, and Market Leveraging suite notation definition

One of the most appropriate parameter suites for the MIQ will be the geological, metallurgical, and market analysis (GMM) parameter suite. The GMM has 5 data points that contribute to the entire suite ($S_2Q_1 – S_2Q_5$).

Table 2.19: MIQ Geological, Metallurgical, and Market Leveraging suite weighting and definition

Parameter Suite Definition	Parameter Suite Designation	Parameter Suite Weighting Designation	Parameter Suite Weighting Value
Geological,	S_2	A_2	0.30

Metallurgical and Market Leveraging			

Table 2.20: MIQ Geological, Metallurgical, and Market Leveraging data point weighting and definition

Data Source	**Data Point Definition**	**Data Point Designation**	**Data Point Weighting Designation**	**Data Point Weighting Value**
Corporate Report	After Tax Lower Limit Discount Rate Gold Leveraging Slope	S_2Q_1	S_2D_1	0.2
Corporate Report	After Tax Lower Limit Discount Rate Drop Dead Price	S_2Q_2	S_2D_2	0.5
Fraser Institute	Mineral Potential, Assuming Current Regulation / Land Use Restrictions	S_2Q_3	S_2D_3	0.1
Fraser Institute	Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime)	S_2Q_4	S_2D_4	0.1
Fraser Institute	Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)	S_2Q_5	S_2D_5	0.1

Sociological and Regional Analysis Methods

$$S_3 = \sum_{j=1}^{5} D_i \cdot f(Q_i)$$

Equation 2.5:Sociological and Regional suite notation definition

Table 2.21: MIQ sociological and regional suite weighting and definition

Parameter Suite Definition	**Parameter Suite Designation**	**Parameter Suite Weighting Designation**	**Parameter Suite Weighting Value**
Sociological and Regional	S_3	A_3	.1

Table 2.22: MIQ sociological and regional data point weighting and definition

Data Source	Data Point Definition	Data Point Designation	Data Point Weighting Designation	Data Point Weighting Value
Fraser Institute	Security (includes physical security due to the threat of attack by terrorists, criminals, guerrila groups, etc.)	S_3Q_1	S_3D_1	.40
Fraser Institute	Availability of Labor and Skills	S_3Q_2	S_3D_2	.1
Fraser Institute	Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites	S_3Q_3	S_3D_3	.1
Fraser Institute	Quality of Infrastructure (includes access to roads, power availability, etc.)	S_3Q_4	S_3D_4	.25
Fraser Institute	Socioeconomic Agreements/Community	S_3Q_5	S_3D_5	.15

The MIQ will be influenced by the sociological consensus of those being affected by the mining venture. Groups in different nations may view a mining venture as immoral and act radically in protest to it. Other groups may find the potential venture as an opportunity for prosperity and work. The Fraser Institute has developed separate parameters to rank a country's potential for acts of terrorism or threats along with potential for local labor.

Political Analysis Methods

$$S_4 = \sum_{j=1}^{3} D_j \cdot f(Q_j)$$

Equation 2.6: political suite notation definition

Table 2.23: MIQ political suite weighting and definition

Parameter Suite Definition	Parameter Suite Designation	Parameter Suite Weighting Designation	Parameter Suite Weighting Value
Political	S4	A4	.1

Table 2.24: MIQ political data point weighting and definition

Data Source	Data Point Definition	Data Point Designation	Data Point Weighting Designation	Data Point Weighting Value
Fraser Institute	Political Stability	S_4Q_1	S_4D_1	.6
Fraser Institute	Trade Barriers—tariff and non-tariff barriers; restrictions on profit repatriation, currency restrictions, etc.	S_4Q_2	S_4D_2	.2
Fraser Institute	Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)	S_4Q_3	S_4D_3	.2

Environmental Analysis Methods

$$S_5 = \sum_{j=1}^{1} D_j \cdot f(Q_j)$$

Equation 2.7: Environmental suite notation definition

Table 2.25: MIQ environmental suite weighting and definition

Parameter Suite Definition	Parameter Suite Designation	Parameter Suite Weighting Designation	Parameter Suite Weighting Value
Environmental	S_5	A_5	.05

Table 2.26: MIQ environmental data point weighting and definition

Data Source	Data Point Definition	Data Point Designation	Data Point Weighting Designation	Data Point Weighting Value
Fraser Institute	Uncertainty Concerning Environmental Regulations	S_5Q_1	S_5D_1	1

Legal Analysis Methods

$$S_6 = \sum_{j=1}^{5} D_j \cdot f(Q_j)$$

Equation 2.8: *Legal suite notation definition*

Table 2.27: MIQ legal suite weighting and definition

Parameter Suite Definition	Parameter Suite Designation	Parameter Suite Weighting Designation	Parameter Suite Weighting Value
Legal	S6	A6	.1

Table 2.28: MIQ legal data point weighting and definition

Data Source	Data Point Definition	Data Point Designation	Data Point Weighting Designation	Data Point Weighting Value
Fraser Institute	Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations	S_6Q_1	S_6D_1	.2
Fraser Institute	Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc,)	S_6Q_2	S_6D_2	.2
Fraser Institute	Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.)	S_6Q_3	S_6D_3	.2
Fraser Institute	Uncertainty Concerning Disputed Land Claims	S_6Q_4	S_6D_4	.2
Fraser Institute	Labor Regulations/Employment Agreements and Labour Militancy/Work Disruptions	S_6Q_5	S_6D_5	.2

Chapter 3: Data and Interpretation

Data

The first data tables show an amalgamation of all data points normalized for each company (Table 3.1-3.6). These values are all 51 data points for every company from S_1Q_1 through S_6Q_5. Each of the 51 normalized values are recorded for all 8 companies totaling 408 data points to be used for corporate comparisons

Table 3.1: All Normalized Financial Suite Data Points (S_1Q_1 – S_1Q_{32}) Table showing each company's normalized value for each of the financial suite's 32 corresponding data points entailed in **Table 2.**14.

Normalized Financial Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_1Q_1	98.5%	71.4%	65.1%	45.3%	45.0%	23.3%	15.4%	13.1%
S_1Q_2	82.0%	37.3%	97.3%	32.7%	35.0%	5.0%	63.1%	35.3%
S_1Q_3	63.1%	66.8%	0.8%	26.3%	68.3%	79.9%	68.7%	68.9%
S_1Q_4	83.1%	37.7%	97.2%	30.9%	34.4%	5.2%	63.9%	34.7%
S_1Q_5	13.2%	0.0%	90.5%	42.3%	0.0%	0.0%	0.0%	0.0%
S_1Q_6	13.0%	0.0%	90.4%	43.0%	0.0%	0.0%	0.0%	0.0%
S_1Q_7	31.1%	78.2%	6.6%	9.9%	75.1%	0.0%	76.8%	86.5%
S_1Q_8	99.5%	25.4%	40.9%	51.1%	33.8%	51.1%	26.1%	25.6%
S_1Q_9	88.8%	19.9%	96.3%	24.1%	26.4%	76.4%	22.0%	22.0%
S_1Q_{10}	32.9%	58.3%	42.0%	66.7%	76.2%	0.9%	81.8%	77.4%
S_1Q_{11}	57.4%	60.2%	55.4%	64.1%	69.8%	0.5%	72.9%	70.4%
S_1Q_{12}	57.5%	75.0%	18.3%	55.6%	74.9%	1.2%	77.8%	76.6%
S_1Q_{13}	57.3%	74.9%	19.4%	55.4%	74.8%	1.1%	77.7%	76.5%
S_1Q_{14}	62.9%	71.9%	32.0%	57.0%	72.0%	0.7%	74.3%	73.4%
S_1Q_{15}	62.0%	72.6%	28.9%	56.5%	72.7%	0.7%	75.2%	74.1%
S_1Q_{16}	70.9%	70.9%	14.8%	1.2%	70.9%	70.9%	70.9%	70.9%
S_1Q_{17}	94.8%	48.1%	84.5%	56.4%	40.9%	2.2%	36.9%	43.2%
S_1Q_{18}	79.4%	39.6%	97.3%	36.0%	36.3%	3.9%	62.5%	37.3%
S_1Q_{19}	92.4%	41.4%	92.9%	38.0%	44.0%	2.9%	41.7%	44.9%
S_1Q_{20}	28.5%	31.4%	35.5%	46.5%	38.2%	99.6%	32.1%	36.6%
S_1Q_{21}	80.6%	11.8%	92.0%	40.8%	27.6%	92.2%	15.5%	25.6%
S_1Q_{22}	73.0%	66.8%	55.8%	53.0%	67.3%	0.5%	67.1%	67.3%
S_1Q_{23}	79.3%	70.0%	70.0%	1.1%	70.0%	62.9%	70.0%	16.7%

S_1Q_{24}	86.4%	62.3%	62.3%	0.6%	62.3%	43.5%	62.3%	62.3%
S_1Q_{25}	15.0%	72.3%	96.6%	59.1%	69.7%	5.4%	52.1%	28.1%
S_1Q_{26}	98.4%	50.0%	29.5%	5.3%	36.6%	71.6%	41.4%	49.7%
S_1Q_{27}	93.8%	69.4%	6.1%	37.7%	65.2%	6.5%	66.7%	69.3%
S_1Q_{28}	93.8%	69.3%	6.1%	37.6%	65.9%	6.5%	66.6%	69.2%
S_1Q_{29}	65.4%	73.1%	0.8%	59.4%	72.1%	26.0%	67.5%	78.1%
S_1Q_{30}	0.0%	0.0%	84.1%	15.9%	0.0%	0.0%	0.0%	0.0%
S_1Q_{31}	58.6%	26.2%	98.6%	24.9%	26.6%	21.3%	82.8%	26.9%
S_1Q_{32}	55.7%	27.0%	98.9%	26.7%	27.0%	21.0%	79.1%	28.0%

Table 3.2: All Normalized Geological, Metallurgical, and Market Leveraging Suite Data Points (S_2Q_1 – S_2Q_5) Table showing each company's normalized value for each of the Geological, Metallurgical, and Market leveraging suite's 5 corresponding data points entailed in **Table 2.**16.

Normalized Sociological and Regional Data Points	**Vista**	**Heron**	**Golden**	**Goldgroup**	**Marathon**	**Rubicon**	**Fortune Bay**	**Meadow Bay**
S_2Q_1	42.4%	32.5%	12.1%	0.0%	96.7%	49.1%	0.0%	0.0%
S_2Q_2	85.6%	79.1%	30.6%	0.0%	4.6%	75.8%	0.0%	0.0%
S_2Q_3	98.1%	65.8%	77.8%	77.8%	89.2%	84.2%	77.8%	93.7%
S_2Q_4	100.0%	82.9%	74.4%	74.4%	89.0%	91.5%	74.4%	97.6%
S_2Q_5	100.0%	96.8%	87.6%	87.6%	97.8%	100.0%	87.6%	90.3%

Table 3.3: All Normalized Sociological and Regional Suite Data Points (S_3Q_1 – S_3Q_5) Table showing each company's normalized value for each of the Geological, Metallurgical, and Market leveraging suite's 5 corresponding data points entailed in **Table 2.**18.

Normalized Sociological and Regional Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_3Q_1	100.0%	95.5%	36.0%	36.0%	98.0%	97.0%	36.0%	99.5%
S_3Q_2	45.9%	41.9%	52.7%	52.7%	63.5%	47.3%	52.7%	56.8%
S_3Q_3	51.1%	39.4%	59.1%	59.1%	67.9%	49.6%	59.1%	69.3%
S_3Q_4	71.9%	93.4%	77.2%	77.2%	75.4%	77.8%	77.2%	98.2%
S_3Q_5	85.2%	72.8%	63.9%	63.9%	79.9%	71.6%	63.9%	95.9%

Table 3.4: All Normalized Political Suite Data Points (S_4Q_1 – S_4Q_3). Table showing each company's normalized value for each of the Political suite's 3 corresponding data points entailed in **Table 2.**20.

Normalized Political Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_4Q_1	95.8%	81.0%	74.6%	74.6%	97.4%	89.9%	74.6%	99.5%
S_4Q_2	93.9%	96.7%	82.2%	82.2%	92.8%	92.2%	82.2%	97.2%
S_4Q_3	85.6%	72.4%	70.1%	70.1%	90.8%	87.4%	70.1%	94.3%

Table 3.5: All Normalized Environmental Suite Data Points (S_5Q_1) Table showing each company's normalized value for the Environmental suite's corresponding data point entailed in **Table 2.**22.

Normalized Environmental Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_5Q_1	80.3%	28.3%	86.7%	86.7%	84.4%	68.2%	86.7%	88.4%

Table 3.6: All Normalized Legal Suite Data Points (S_6Q_1 – S_6Q_5) Table showing each company's normalized value for each of the Legal suite's 5 corresponding data points entailed in **Table 2.**20.

Normalized Legal Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_6Q_1	91.5%	45.0%	81.0%	81.0%	93.1%	71.4%	81.0%	93.1%
S_6Q_2	86.4%	49.7%	84.2%	84.2%	86.4%	72.3%	84.2%	90.4%
S_6Q_3	97.4%	67.3%	68.9%	68.9%	96.4%	90.3%	68.9%	96.9%
S_6Q_4	65.2%	45.5%	63.6%	63.6%	73.5%	41.7%	63.6%	96.2%
S_6Q_5	83.1%	73.4%	69.5%	69.5%	84.2%	88.1%	69.5%	97.2%

RAW Weighted Data

Table 3.7 RAW Weighted Financial Suite Data Points ($S_1Q_1*S_1D_1 – S_1Q_{32}*S_1D_{32}$)

RAW Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
$S_1Q_1*S_1D_1$	3.1%	2.2%	2.0%	1.4%	1.4%	0.7%	0.5%	0.4%
$S_1Q_2*S_1D_2$	2.6%	1.2%	3.0%	1.0%	1.1%	0.2%	2.0%	1.1%
$S_1Q_3*S_1D_3$	2.0%	2.1%	0.0%	0.8%	2.1%	2.5%	2.1%	2.2%
$S_1Q_4*S_1D_4$	2.6%	1.2%	3.0%	1.0%	1.1%	0.2%	2.0%	1.1%
$S_1Q_5*S_1D_5$	0.4%	0.0%	2.8%	1.3%	0.0%	0.0%	0.0%	0.0%
$S_1Q_6*S_1D_6$	0.4%	0.0%	2.8%	1.3%	0.0%	0.0%	0.0%	0.0%
$S_1Q_7*S_1D_7$	1.0%	2.4%	0.2%	0.3%	2.3%	0.0%	2.4%	2.7%
$S_1Q_8*S_1D_8$	3.1%	0.8%	1.3%	1.6%	1.1%	1.6%	0.8%	0.8%
$S_1Q_9*S_1D_9$	2.8%	0.6%	3.0%	0.8%	0.8%	2.4%	0.7%	0.7%
$S_1Q_{10}*S_1D_{10}$	1.0%	1.8%	1.3%	2.1%	2.4%	0.0%	2.6%	2.4%
$S_1Q_{11}*S_1D_{11}$	1.8%	1.9%	1.7%	2.0%	2.2%	0.0%	2.3%	2.2%
$S_1Q_{12}*S_1D_{12}$	1.8%	2.3%	0.6%	1.7%	2.3%	0.0%	2.4%	2.4%
$S_1Q_{13}*S_1D_{13}$	1.8%	2.3%	0.6%	1.7%	2.3%	0.0%	2.4%	2.4%
$S_1Q_{14}*S_1D_{14}$	2.0%	2.2%	1.0%	1.8%	2.3%	0.0%	2.3%	2.3%
$S_1Q_{15}*S_1D_{15}$	1.9%	2.3%	0.9%	1.8%	2.3%	0.0%	2.3%	2.3%
$S_1Q_{16}*S_1D_{16}$	2.2%	2.2%	0.5%	0.0%	2.2%	2.2%	2.2%	2.2%
$S_1Q_{17}*S_1D_{17}$	3.0%	1.5%	2.6%	1.8%	1.3%	0.1%	1.2%	1.4%
$S_1Q_{18}*S_1D_{18}$	2.5%	1.2%	3.0%	1.1%	1.1%	0.1%	2.0%	1.2%
$S_1Q_{19}*S_1D_{19}$	2.9%	1.3%	2.9%	1.2%	1.4%	0.1%	1.3%	1.4%
$S_1Q_{20}*S_1D_{20}$	0.9%	1.0%	1.1%	1.5%	1.2%	3.1%	1.0%	1.1%
$S_1Q_{21}*S_1D_{21}$	2.5%	0.4%	2.9%	1.3%	0.9%	2.9%	0.5%	0.8%
$S_1Q_{22}*S_1D_{22}$	2.3%	2.1%	1.7%	1.7%	2.1%	0.0%	2.1%	2.1%

S_1Q_{23}*S_1D_{23}	2.5%	2.2%	2.2%	0.0%	2.2%	2.0%	2.2%	0.5%
S_1Q_{24}*S_1D_{24}	2.7%	1.9%	1.9%	0.0%	1.9%	1.4%	1.9%	1.9%
S_1Q_{25}*S_1D_{25}	0.5%	2.3%	3.0%	1.8%	2.2%	0.2%	1.6%	0.9%
S_1Q_{26}*S_1D_{26}	3.1%	1.6%	0.9%	0.2%	1.1%	2.2%	1.3%	1.6%
S_1Q_{27}*S_1D_{27}	2.9%	2.2%	0.2%	1.2%	2.0%	0.2%	2.1%	2.2%
S_1Q_{28}*S_1D_{28}	2.9%	2.2%	0.2%	1.2%	2.1%	0.2%	2.1%	2.2%
S_1Q_{29}*S_1D_{29}	2.0%	2.3%	0.0%	1.9%	2.3%	0.8%	2.1%	2.4%
S_1Q_{30}*S_1D_{30}	0.0%	0.0%	2.6%	0.5%	0.0%	0.0%	0.0%	0.0%
S_1Q_{31}*S_1D_{31}	1.8%	0.8%	3.1%	0.8%	0.8%	0.7%	2.6%	0.8%
S_1Q_{32}*S_1D_{32}	1.7%	0.8%	3.1%	0.8%	0.8%	0.7%	2.5%	0.9%

Table 3.8: Financial Suite Totals and RAW weighted suite contribution

RAW Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_1	64.6%	49.3%	56.5%	37.5%	49.3%	24.5%	53.5%	46.5%
A_1	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
Total RAW Weighted Financial Suite Contribution (S_1*A_1)	10.8%	8.2%	9.4%	6.3%	8.2%	4.1%	8.9%	7.8%

Table 3.9: RAW Weighted Geological, Metallurgical, and Market Leveraging Suite Data Points (**S_2Q_1***S_2D_1 – **S_2Q_5***S_2D_5)

RAW Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_2Q_1*S_2D_1	8.5%	6.5%	2.4%	0.0%	19.3%	9.8%	0.0%	0.0%

S_2Q_2*S_2D_2	17.1%	15.8%	6.1%	0.0%	0.9%	15.2%	0.0%	0.0%
S_2Q_3*S_2D_3	19.6%	13.2%	15.6%	15.6%	17.8%	16.8%	15.6%	18.7%
S_2Q_4*S_2D_4	20.0%	16.6%	14.9%	14.9%	17.8%	18.3%	14.9%	19.5%
S_2Q_5*S_2D_5	20.0%	19.4%	17.5%	17.5%	19.6%	20.0%	17.5%	18.1%

Table 3.10: Geological, Metallurgical, and Market Leveraging Suite Totals and RAW weighted suite contribution

RAW Weighted Totals	**Vista**	**Heron**	**Golden**	**Goldgroup**	**Marathon**	**Rubicon**	**Fortune Bay**	**Meadow Bay**
S_2	85.2%	71.4%	56.5%	48.0%	75.5%	80.1%	48.0%	56.3%
A_2	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
Total RAW Weighted Financial Suite Contribution (S_2*A_2)	14.2%	11.9%	9.4%	8.0%	12.6%	13.4%	8.0%	9.4%

Table 3.11: RAW Weighted Sociological and Regional Suite Data Points (**S_3Q_1***S_3D_1 – **S_3Q_5***S_3D_5)

RAW Weighted Data Points	**Vista**	**Heron**	**Golden**	**Goldgroup**	**Marathon**	**Rubicon**	**Fortune Bay**	**Meadow Bay**
S_3Q_1*S_3D_1	20.0%	19.1%	7.2%	7.2%	19.6%	19.4%	7.2%	19.9%
S_3Q_2*S_3D_2	9.2%	8.4%	10.5%	10.5%	12.7%	9.5%	10.5%	11.4%

S_3Q_3*S_3D_3	10.2%	7.9%	11.8%	11.8%	13.6%	9.9%	11.8%	13.9%
S_3Q_4*S_3D_4	14.4%	18.7%	15.4%	15.4%	15.1%	15.6%	15.4%	19.6%
S_3Q_5*S_3D_5	17.0%	14.6%	12.8%	12.8%	16.0%	14.3%	12.8%	19.2%

Table 3.12: Sociological and Regional Suite Totals and RAW Weighted Suite Contribution

RAW Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_3	70.8%	68.6%	57.8%	57.8%	76.9%	68.7%	57.8%	83.9%
A_3	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
Total RAW Weighted Financial Suite Contribution (S_3*A_3)	7.1%	6.9%	5.8%	5.8%	7.7%	6.9%	5.8%	8.4%

Table 3.13: Sociological and Regional Suite Totals and RAW Weighted Suite Contribution

RAW Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_4Q_1*S_4D_1	31.9%	27.0%	24.9%	24.9%	32.5%	30.0%	24.9%	33.2%
S_4Q_2*S_4D_2	31.3%	32.2%	27.4%	27.4%	30.9%	30.7%	27.4%	32.4%

S_4Q_3*S_4D_3	28.5%	24.1%	23.4%	23.4%	30.3%	29.1%	23.4%	31.4%

Table 3.14: Political Suite Totals and RAW Weighted Suite Contribution

RAW Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_4	91.8%	83.3%	75.6%	75.6%	93.6%	89.8%	75.6%	97.0%
A_4	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
Total RAW Weighted Financial Suite Contribution (S_4*A_4)	15.3%	13.9%	12.6%	12.6%	15.6%	15.0%	12.6%	16.2%

Table 3.15: RAW Weighted Environmental Suite Data Points (S_5Q_1*S_5D_1)

RAW Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_5Q_1*S_5D_1	80.3%	28.3%	86.7%	86.7%	84.4%	68.2%	86.7%	88.4%

Table 3.16: Environmental Suite Totals and RAW Weighted Suite Contribution

RAW Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_5	80.3%	28.3%	86.7%	86.7%	84.4%	68.2%	86.7%	88.4%
A_5	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%

Total RAW Weighted Financial Suite Contribution (S_5*A_5)	13.4%	4.7%	14.5%	14.5%	14.1%	11.4%	14.5%	14.7%

Table 3.17: RAW Weighted Legal Suite Data Points ($\mathbf{S_6Q_1}$*S_6D_1– $\mathbf{S_6Q_5}$*S_6D_5)

RAW Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
$\mathbf{S_6Q_1}$*S_6D_1	18.3%	9.0%	16.2%	16.2%	18.6%	14.3%	16.2%	18.6%
$\mathbf{S_6Q_2}$*S_6D_2	17.3%	9.9%	16.8%	16.8%	17.3%	14.5%	16.8%	18.1%
$\mathbf{S_6Q_3}$*S_6D_3	19.5%	13.5%	13.8%	13.8%	19.3%	18.1%	13.8%	19.4%
$\mathbf{S_6Q_4}$*S_6D_4	13.0%	9.1%	12.7%	12.7%	14.7%	8.3%	12.7%	19.2%
$\mathbf{S_6Q_5}$*S_6D_5	16.6%	14.7%	13.9%	13.9%	16.8%	17.6%	13.9%	19.4%

Table 3.18: Environmental Suite Totals and RAW Weighted Suite Contribution

RAW Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
$\mathbf{S_6}$	84.7%	56.2%	73.4%	73.4%	86.7%	72.8%	73.4%	94.8%
$\mathbf{A_6}$	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%

Total RAW Weighted Legal Suite Contribution (S_6*A_6)	14.1%	9.4%	12.2%	12.2%	14.5%	12.1%	12.2%	15.8%

MIQ Weighted Data

Table 3.19: MIQ Weighted Financial Suite Data Points ($S_1Q_1*S_1D_1 – S_1Q_{32}*S_1D_{32}$)

MIQ Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
$S_1Q_1*S_1D_1$	14.8%	10.7%	9.8%	6.8%	6.7%	3.5%	2.3%	2.0%
$S_1Q_2*S_1D_2$	7.4%	3.4%	8.8%	2.9%	3.2%	0.4%	5.7%	3.2%
$S_1Q_3*S_1D_3$	0.6%	0.7%	0.0%	0.3%	0.7%	0.8%	0.7%	0.7%
$S_1Q_4*S_1D_4$	4.2%	1.9%	4.9%	1.5%	1.7%	0.3%	3.2%	1.7%
$S_1Q_5*S_1D_5$	0.1%	0.0%	0.9%	0.4%	0.0%	0.0%	0.0%	0.0%
$S_1Q_6*S_1D_6$	0.1%	0.0%	0.9%	0.4%	0.0%	0.0%	0.0%	0.0%
$S_1Q_7*S_1D_7$	0.3%	0.8%	0.1%	0.1%	0.8%	0.0%	0.8%	0.9%
$S_1Q_8*S_1D_8$	1.0%	0.3%	0.4%	0.5%	0.3%	0.5%	0.3%	0.3%
$S_1Q_9*S_1D_9$	0.9%	0.2%	1.0%	0.2%	0.3%	0.8%	0.2%	0.2%
$S_1Q_{10}*S_1D_{10}$	0.7%	1.2%	0.8%	1.3%	1.5%	0.0%	1.6%	1.5%
$S_1Q_{11}*S_1D_{11}$	1.7%	1.8%	1.7%	1.9%	2.1%	0.0%	2.2%	2.1%
$S_1Q_{12}*S_1D_{12}$	2.9%	3.7%	0.9%	2.8%	3.7%	0.1%	3.9%	3.8%
$S_1Q_{13}*S_1D_{13}$	0.6%	0.7%	0.2%	0.6%	0.7%	0.0%	0.8%	0.8%
$S_1Q_{14}*S_1D_{14}$	0.6%	0.7%	0.3%	0.6%	0.7%	0.0%	0.7%	0.7%
$S_1Q_{15}*S_1D_{15}$	0.6%	0.7%	0.3%	0.6%	0.7%	0.0%	0.8%	0.7%
$S_1Q_{16}*S_1D_{16}$	2.1%	2.1%	0.4%	0.0%	2.1%	2.1%	2.1%	2.1%
$S_1Q_{17}*S_1D_{17}$	0.9%	0.5%	0.8%	0.6%	0.4%	0.0%	0.4%	0.4%
$S_1Q_{18}*S_1D_{18}$	1.6%	0.8%	1.9%	0.7%	0.7%	0.1%	1.3%	0.7%
$S_1Q_{19}*S_1D_{19}$	1.8%	0.8%	1.9%	0.8%	0.9%	0.1%	0.8%	0.9%
$S_1Q_{20}*S_1D_{20}$	0.3%	0.3%	0.4%	0.5%	0.4%	1.0%	0.3%	0.4%
$S_1Q_{21}*S_1D_{21}$	8.1%	1.2%	9.2%	4.1%	2.8%	9.2%	1.5%	2.6%
$S_1Q_{22}*S_1D_{22}$	0.7%	0.7%	0.6%	0.5%	0.7%	0.0%	0.7%	0.7%

S_1Q_{23}*S_1D_{23}	2.4%	2.1%	2.1%	0.0%	2.1%	1.9%	2.1%	0.5%
S_1Q_{24}*S_1D_{24}	0.9%	0.6%	0.6%	0.0%	0.6%	0.4%	0.6%	0.6%
S_1Q_{25}*S_1D_{25}	0.1%	0.7%	1.0%	0.6%	0.7%	0.1%	0.5%	0.3%
S_1Q_{26}*S_1D_{26}	4.9%	2.5%	1.5%	0.3%	1.8%	3.6%	2.1%	2.5%
S_1Q_{27}*S_1D_{27}	4.7%	3.5%	0.3%	1.9%	3.3%	0.3%	3.3%	3.5%
S_1Q_{28}*S_1D_{28}	4.7%	3.5%	0.3%	1.9%	3.3%	0.3%	3.3%	3.5%
S_1Q_{29}*S_1D_{29}	0.7%	0.7%	0.0%	0.6%	0.7%	0.3%	0.7%	0.8%
S_1Q_{30}*S_1D_{30}	0.0%	0.0%	1.7%	0.3%	0.0%	0.0%	0.0%	0.0%
S_1Q_{31}*S_1D_{31}	2.9%	1.3%	4.9%	1.2%	1.3%	1.1%	4.1%	1.3%
S_1Q_{32}*S_1D_{32}	2.8%	1.4%	4.9%	1.3%	1.4%	1.0%	4.0%	1.4%

Table 3.20: Financial Suite Totals and MIQ weighted suite contribution

MIQ Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_1	76.1%	49.4%	63.4%	36.3%	46.4%	27.9%	51.0%	40.8%
A_1	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
Total MIQ Weighted Financial Suite Contribution (S_1*A_1)	26.6%	17.3%	22.2%	12.7%	16.2%	9.8%	17.8%	14.3%

Table 3.8:

Table 3.21: MIQ Weighted Geological, Metallurgical, and Market Leveraging Suite Data Points (**S_2Q_1***S_2D_1 – **S_2Q_5***S_2D_5)

MIQ Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay

S_2Q_1*S_2D_1	8.5%	6.5%	2.4%	0.0%	19.3%	9.8%	0.0%	0.0%
S_2Q_2*S_2D_2	42.8%	39.5%	15.3%	0.0%	2.3%	37.9%	0.0%	0.0%
S_2Q_3*S_2D_3	9.8%	6.6%	7.8%	7.8%	8.9%	8.4%	7.8%	9.4%
S_2Q_4*S_2D_4	10.0%	8.3%	7.4%	7.4%	8.9%	9.1%	7.4%	9.8%
S_2Q_5*S_2D_5	10.0%	9.7%	8.8%	8.8%	9.8%	10.0%	8.8%	9.0%

Table 3.22: Geological, Metallurgical, and Market Leveraging Suite Totals and MIQ weighted suite contribution

MIQ Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_2	81.1%	70.6%	41.7%	24.0%	49.2%	75.3%	24.0%	28.2%
A_2	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Total MIQ Weighted Financial Suite Contribution (S_2*A_2)	24.3%	21.2%	12.5%	7.2%	14.8%	22.6%	7.2%	8.4%

Table 3.23: MIQ Weighted Sociological and Regional Suite Data Points (**S_3Q_1***S_3D_1 – **S_3Q_5***S_3D_5)

MIQ Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_3Q_1*S_3D_1	40.0%	38.2%	14.4%	14.4%	39.2%	38.8%	14.4%	39.8%

S_3Q_2*S_3D_2	4.6%	4.2%	5.3%	5.3%	6.4%	4.7%	5.3%	5.7%
S_3Q_3*S_3D_3	5.1%	3.9%	5.9%	5.9%	6.8%	5.0%	5.9%	6.9%
S_3Q_4*S_3D_4	18.0%	23.4%	19.3%	19.3%	18.9%	19.5%	19.3%	24.6%
S_3Q_5*S_3D_5	12.8%	10.9%	9.6%	9.6%	12.0%	10.7%	9.6%	14.4%

Table 3.24: Sociological and Regional Suite Totals and MIQ Weighted Suite Contribution

MIQ Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_3	80.4%	80.6%	54.5%	54.5%	83.2%	78.7%	54.5%	91.3%
A_3	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Total MIQ Weighted Financial Suite Contribution (S_3*A_3)	8.0%	8.1%	5.4%	5.4%	8.3%	7.9%	5.4%	9.1%

Table 3.25: MIQ Weighted Political Suite Data Points (**S_4Q_1***S_4D_1– **S_4Q_3***S_4D_3)

MIQ Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_4Q_1*S_4D_1	57.5%	48.6%	44.8%	44.8%	58.4%	54.0%	44.8%	59.7%
S_4Q_2*S_4D_2	18.8%	19.3%	16.4%	16.4%	18.6%	18.4%	16.4%	19.4%

S_4Q_3*S_4D_3	17.1%	14.5%	14.0%	14.0%	18.2%	17.5%	14.0%	18.9%

Table 3.26: Political Suite Totals and MIQ Weighted Suite Contribution

MIQ Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_4	93.4%	82.4%	75.2%	75.2%	95.1%	89.9%	75.2%	98.0%
A_4	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Total MIQ Weighted Financial Suite Contribution (S_4*A_4)	9.3%	8.2%	7.5%	7.5%	9.5%	9.0%	7.5%	9.8%

Table 3.27: MIQ Weighted Environmental Suite Data Points (S_5Q_1*S_5D_1)

MIQ Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_5Q_1*S_5D_1	80.3%	28.3%	86.7%	86.7%	84.4%	68.2%	86.7%	88.4%

Table 3.28: Environmental Suite Totals and MIQ Weighted Suite Contribution

MIQ Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_5	80.3%	28.3%	86.7%	86.7%	84.4%	68.2%	86.7%	88.4%
A_5	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

Total MIQ Weighted Financial Suite Contribution (S_5*A_5)	4.0%	1.4%	4.3%	4.3%	4.2%	3.4%	4.3%	4.4%

Table 3.29: MIQ Weighted Legal Suite Data Points (**S_6Q_1***S_6D_1– **S_6Q_5***S_6D_5)

MIQ Weighted Data Points	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_6Q_1*S_6D_1	18.3%	9.0%	16.2%	16.2%	18.6%	14.3%	16.2%	18.6%
S_6Q_2*S_6D_2	17.3%	9.9%	16.8%	16.8%	17.3%	14.5%	16.8%	18.1%
S_6Q_3*S_6D_3	19.5%	13.5%	13.8%	13.8%	19.3%	18.1%	13.8%	19.4%
S_6Q_4*S_6D_4	13.0%	9.1%	12.7%	12.7%	14.7%	8.3%	12.7%	19.2%
S_6Q_5*S_6D_5	16.6%	14.7%	13.9%	13.9%	16.8%	17.6%	13.9%	19.4%

Table 3.30: Environmental Suite Totals and MIQ Weighted Suite Contribution

MIQ Weighted Totals	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
S_6	84.7%	56.2%	73.4%	73.4%	86.7%	72.8%	73.4%	94.8%
A_6	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

Total MIQ Weighted Legal Suite Contribution (S_6*A_6)	8.5%	5.6%	7.3%	7.3%	8.7%	7.3%	7.3%	9.5%

RAW and MIQ Company Totals

Table 3.31:

	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
RAW Total	74.9%	55.0%	63.9%	59.3%	72.6%	62.8%	62.0%	72.2%
MIQ Total	80.8%	61.8%	59.3%	44.5%	61.7%	59.9%	49.7%	55.6%

Interpretation

Once we have the two varying processing methods we can run correlation coefficients of each known parameter. We want to show that the MIQ weighting scheme has a greater correlation to the equally weighted version, RAW. All correlation coefficients are correlated to the normalized QMV. If we remember correctly the QMV represents a market computed worth of a company less the float shares. For the sake of interpretation we can say the normalized value of QMV is the health of the company. The most important correlation we want to see is between the RAW and MIQ.

The RAW had a correlation coefficient of -12.8% to the normalized QMV and the MIQ had a correlation coefficient of 61.6% to the normalized QMV (Table 3.34). The weighting method provided by the MIQ shows significant results in comparison to the RAW. Figure 3.1 and 3.2 show RAW weighting scores overlaying the normalized QMV and the MIQ scores overlaying the normalized QMV. We can see that as QMV decreases we would expect the scores to decrease as well. The trend of the RAW is inverse to the QMV whereas the MIQ trend in congruent.

Table 3.32: Data Point Correlation Coefficients to Normalized Quoted Market Value

Financial Data Points	Correlation Coefficient
Market Capitalization	96.6%
Net Income before Taxes	52.9%
Cash Flow: Depreciation and Amortization	-35.2%
EBITDA	53.3%
EBITDA/ Interest Expense	36.7%
EBITDA before Capital Expense/ Interest Expense	36.5%
Price/Book (%)	-24.6%
Institutional Ownership (%)	51.3%
Number of Institutions	44.4%
Current Assets	-30.2%
Working Capital	4.9%
Total Assets	-7.8%
Tangible Assets	-7.6%
Total Equity	3.6%

Total Capitalization, at Book Value	1.0%
Operating Revenue, Net	-18.1%
Net Operating Profit After Tax	72.0%
Net Income	53.0%
Cash Flow from Operating Activities	64.0%
Cash Flow from Investing Activities	-38.2%
Net Free Cash Flow	28.5%
Total Equity/ Total Assets	29.8%
Total Debt/ Total Equity (x)	42.3%
Long-term Debt/ Book Capital	30.1%
Net Free Cash Flow Yield	27.8%
ROAA	27.7%
ROAE	17.5%
ROACE	17.3%
Return on Invested Capital	-15.8%
Operating Revenue Growth	30.6%
EBITDA/ Share	23.6%
Basic EPS after Extra	24.1%
Geological, Metallurgical, and Market Leveraging Data Points	**Correlation Coefficient**
After Tax Lower Limit Discount Rate Gold Leveraging Slope	11.6%
After Tax Lower Limit Discount Rate Drop Dead Price	65.9%
Mineral Potential, Assuming Current Regulation / Land Use Restrictions	-20.4%
Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime)	-0.3%
Quality of Geological Database (includes quality and scale of maps, ease of access to information, etc.)	28.7%
Sociological and Regional Data Points	**Correlation Coefficient**
Security (includes physical security due to the threat of attack by terrorists, criminals, guerrila groups, etc.)	6.4%
Availability of Labor and Skills	-60.1%
Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites	-63.9%
Quality of Infrastructure (includes access to roads, power availability, etc.)	-17.9%
Socioeconomic Agreements/Community	-12.0%
Political Data Points	**Correlation Coefficient**
Political Stability	-17.7%

Trade Barriers—tariff and non-tariff barriers; restrictions on profit repatriation, currency restrictions, etc.	9.1%
Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)	-35.6%
Environmental Data Points	**Correlation Coefficient**
Uncertainty Concerning Environmental Regulations	-47.2%
Legal Data Points	**Correlation Coefficient**
Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations	-37.6%
Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc,)	-41.7%
Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.)	-22.9%
Uncertainty Concerning Disputed Land Claims	-39.5%
Labor Regulations/Employment Agreements and Labour Militancy/Work Disruptions	-39.8%

Table 3.33:

Percentage Financial Data Point Correlation Coefficients greater than 0	Percentage Financial Data Point Correlation Coefficients greater than 0.5	Percentage Financial Data Point Correlation Coefficients greater than 0.75
75.0%	21.9%	3.1%
Percentage GMM Data Point Correlation Coefficients greater than 0	Percentage GMM Data Point Correlation Coefficients greater than 0.5	Percentage GMM Data Point Correlation Coefficients greater than 0.75
60.0%	20.0%	0.0%
Percentage Sociological and Regional Data Point Correlation Coefficients greater than 0	Percentage Sociological and Regional Data Point Correlation Coefficients greater than 0.5	Percentage Sociological and Regional Data Point Correlation Coefficients greater than 0.75
20.0%	0.0%	0.0%
Percentage Political Data Point Correlation Coefficients greater than 0	Percentage Political Data Point Correlation Coefficients greater than 0.5	Percentage Political Data Point Correlation Coefficients greater than 0.75
33.3%	0.0%	0.0%
Percentage Environmental Data Point Correlation Coefficients greater than 0	Percentage Environmental Data Point Correlation Coefficients greater than 0.5	Percentage Environmental Data Point Correlation Coefficients greater than 0.75
0.0%	0.0%	0.0%
Percentage Legal Data Point Correlation Coefficients greater than 0	Percentage Legal Data Point Correlation Coefficients greater than 0.5	Percentage Legal Data Point Correlation Coefficients greater than 0.75

0.0%	0.0%	0.0%

Table 3.34: RAW vs MIQ Weighted Total Correlation Coefficients to Quoted Market Value

Weighting Contribution Method	Correlation Coefficient
RAW	-12.8%
MIQ	61.6%

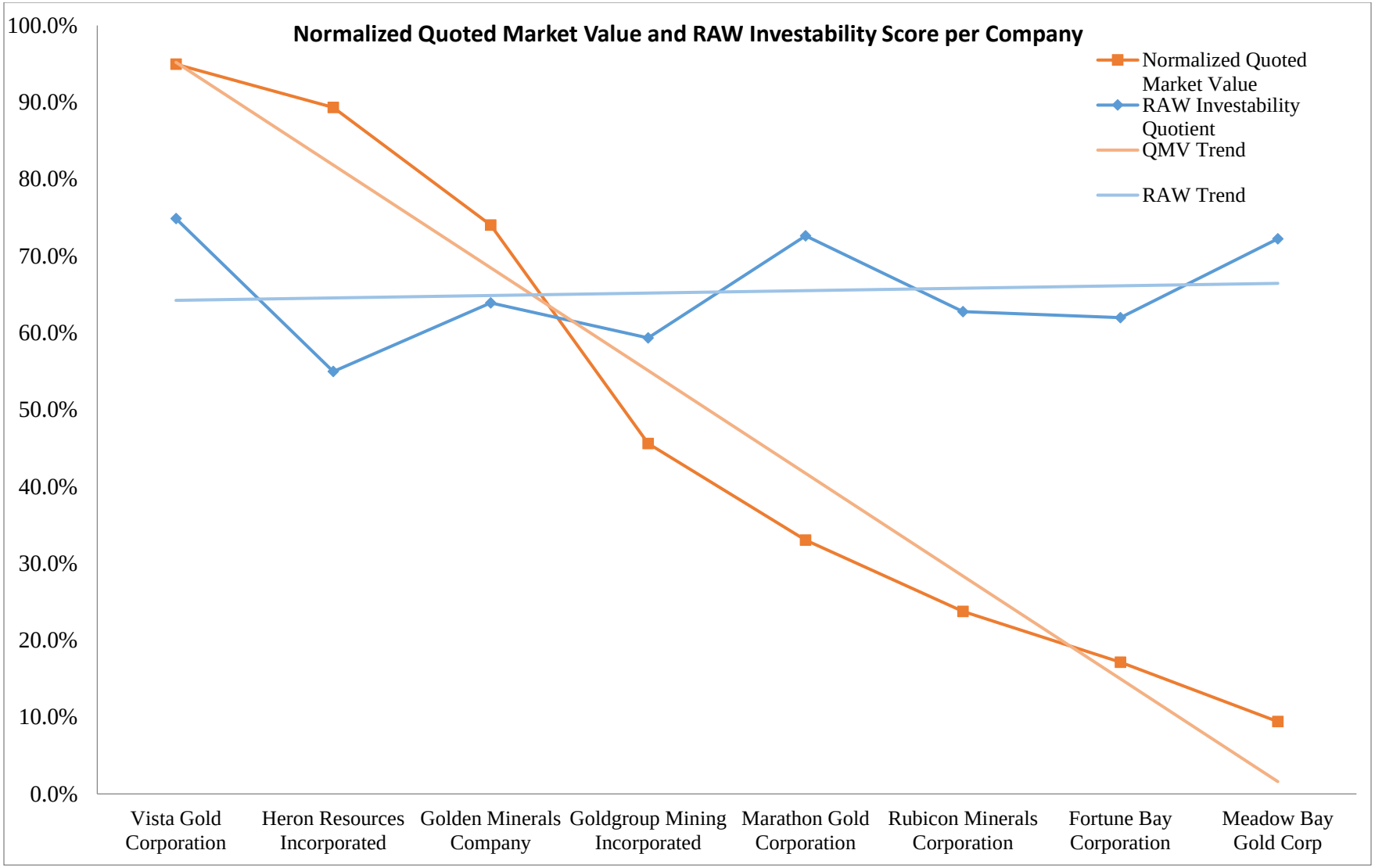

Figure 3.1: Correlation graphs of normalized QMV and RAW investability quotient showing the -12.1% correlation coefficient.

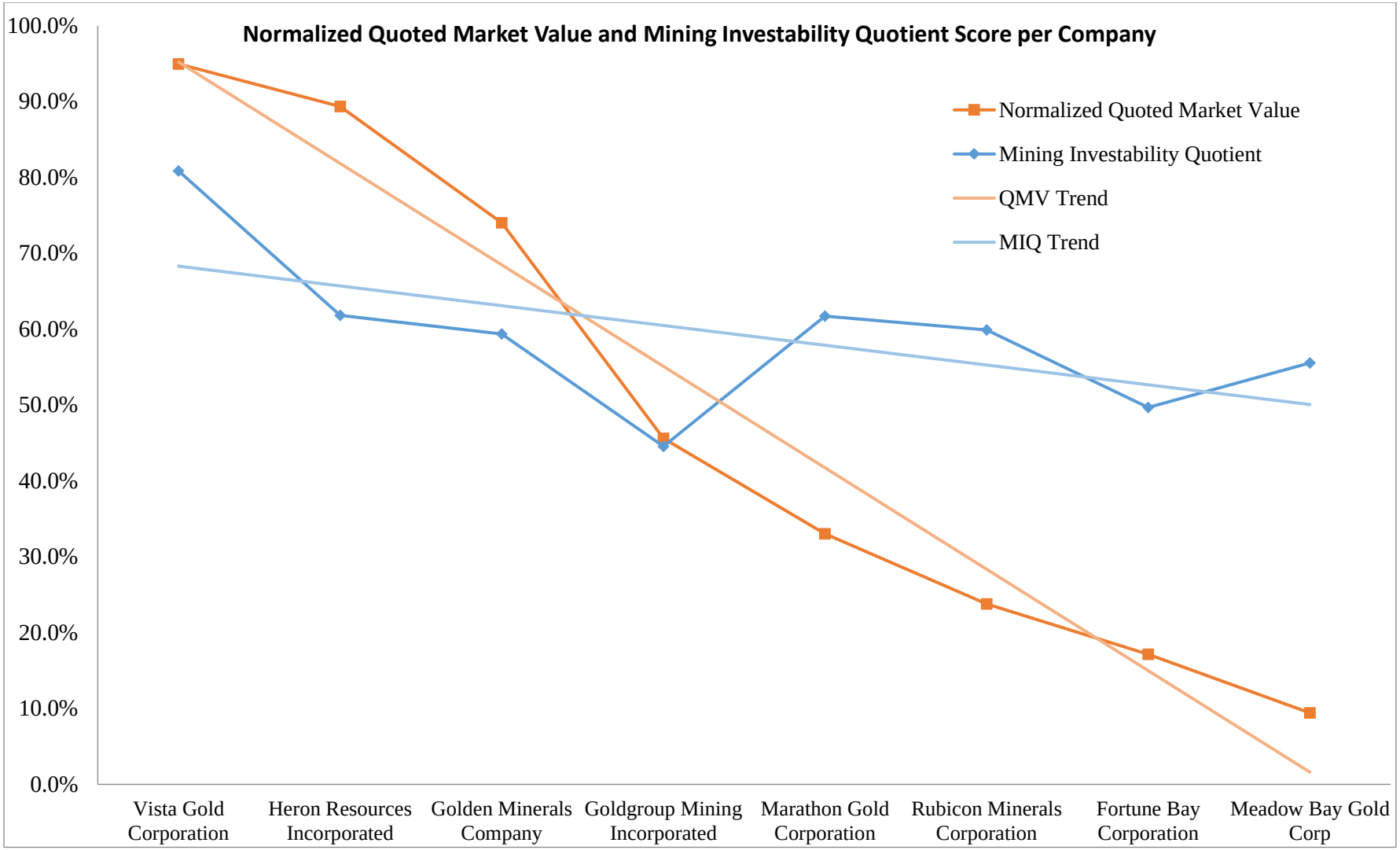

Figure 3.2: Correlation graphs of normalized QMV and MIQ showing the 61.6% correlation coefficient.

The average normalized value for all the Vista Gold Corporation data points was 71.1% out of 100%. Vista Gold Corporation had an average value of 64.6% for their financial data points, average Geological Metallurgical and Market Leveraging value of 85.2%, 70.8% for their Sociological and Regional Data points, 91.8% for their Political data points, 80.3% for the Environmental Data points and 84.7% for their Legal Data Points. Vista gold had the highest average Financial and Geological, Metallurgical, and Market Leveraging data points of its' sample set.

The average normalized value for all of the Heron Resources data points was 55.7% out of 100%. Heron Resources had an average value of 49.3% for their financial data points, average Geological Metallurgical and Market Leveraging value of 71.4%, 68.6% for their Sociological and Regional Data points, 83.3% for their Political data points, 28.3% for the Environmental Data points and 56.2% for their Legal Data Points. Heron resources had the lowest average scores for their environmental and Legal data points.

The average normalized value for all of the Golden Minerals Company data points was 60.0% out of 100%. Golden Minerals Company had an average value of 56.5% for their financial data points, average Geological Metallurgical and Market Leveraging value of 56.5%, 57.8% for their Sociological and Regional Data points, 75.6% for their Political data points, 86.7% for the Environmental Data points and 73.4% for their Legal Data Points. Golden Minerals shared the title for lowest average Sociological and Political data points with Goldgroup Mining Incorporated and Fortune Bay Corporation.

The average normalized value for Goldgroup Mining Incorporated was 47.3% out of 100%. Goldgroup Mining Incorporated had an average value of 35.7% for their financial data points, average Geological Metallurgical and Market Leveraging value of 48.0%, 57.8% for their Sociological and Regional Data points, 75.6% for their Political data points, 86.7% for the Environmental Data points and 73.4% for their Legal Data Points.

The average normalized value for Marathon Gold Corporation was 61.6% out of 100%. Marathon Gold Corporation had an average value of 49.3% for their financial data points,

average Geological Metallurgical and Market Leveraging value of 75.5%, 76.9% for their Sociological and Regional Data points, 93.6% for their Political data points, 84.4% for the Environmental Data points and 86.7% for their Legal Data Points.

The average normalized value for all Rubicon Minerals Corporation data points was 43.7% out of 100%. Rubicon had the lowest average score for all data points of the sample set. Rubicon Minerals Corporation had an average value of 24.5% for their financial data points, average Geological Metallurgical and Market Leveraging value of 80.1%, 68.7% for their Sociological and Regional Data points, 89.8% for their Political data points, 68.2% for the Environmental Data points and 72.8% for their Legal Data Points. As previously mentioned Rubicon received the lowest average for all data points but they also had the lowest average for their financial data points.

The average normalized value for all Fortune Bay Corporation data points was 57.3% out of 100%. Fortune Bay Corporation had an average value of 53.5% for their financial data points, average Geological Metallurgical and Market Leveraging value of 48.0%, 57.8% for their Sociological and Regional Data points, 75.6% for their Political data points, 86.7% for the Environmental Data points and 73.4% for their Legal Data Points. Fortune Bay Corporation shared the lowest average Geological, Metallurgical, and Market Leveraging data points with Goldgroup Mining Incorporated. Fortune Bay also shared the lowest average Sociological and Political Data points with Gold Group and Golden Minerals.

The average normalized value for all Meadow Bay Gold Corporation data points were 59.7% out of 100%. Meadow Bay had an average value of 46.5% for their financial data points, average Geological Metallurgical and Market Leveraging value of 56.3%, 83.9% for their Sociological and Regional Data points, 97.0% for their Political data points, 88.4% for the Environmental Data points and 94.8% for their Legal Data Points. Meadow Bay, although acknowledged as the weakest company in the sample set according to QMV, possessed the highest average scores for 4 of the 6 categories. They were responsible for the highest marks in Political, Sociological, Environmental, and Legal Data points. (Table 3.x

Table 3.35:Average Suite Scores Per Company

	Vista	Heron	Golden	Goldgroup	Marathon	Rubicon	Fortune Bay	Meadow Bay
Average Financial Data Points	65%	49%	57%	38%	49%	25%	54%	47%
Average Geological, Metallurgical, and Market Leveraging Data Points	85%	71%	57%	48%	76%	80%	48%	56%
Average Sociological and Regional Data Points	71%	69%	58%	58%	77%	69%	58%	84%
Average Political Data Points	92%	83%	76%	76%	94%	90%	76%	97%
Average Environmental Data Points	80%	28%	87%	87%	84%	68%	87%	88%
Average Legal Data Points	85%	56%	73%	73%	87%	73%	73%	95%
Total Average of All Normalized Data points	71%	56%	60%	47%	62%	44%	57%	60%

Discussion

The Mining Investability Quotient was invented as a means of objectively viewing mining companies within their class. Using these commonly reported attributes to a mining company allowed us to normalized data for comparison for the corresponding company's relative market health identified as normalized Quoted Market Value. I was pleased with the discrepancy of results between the MIQ and RAW processing methods with correlation to the normalized QMV. As previously stated the RAW processing method had a -12.8% correlation to the normalized QMV and the MIQ had a 61.6% correlation coefficient to the normalized QMV. This means that the weightings applied to individual data points and parameter suites as contribution to the MIQ were more correlative than an equally balanced contribution scheme.

This experiment entailed a large amalgamation of data sources that carried inherent uncertainty. And as a result there were discordant results disseminated throughout the entire methodology. The entire point of this experiment was to establish a framework for analyzing these companies. The possibilities for quantifying these companies are a task analogous to the mining industry in magnitude. Steps for appropriate progressions to this will be discussed in the Further Studies section but for the time being it is important to reason with the inherent errors of this data processing scheme.

Let's start from the beginning. The task we were trying to achieve was emulating the due diligence put forward by a resource investment professional. We are trying to quantify a broker's opinion about a company through linear regression models of reported data. This leads us to question what an average resource investment broker constitutes as pertinent information. Upon working for Sprott Global Resource Investments Ltd. I was exposed to the error in my paradigm of what is considered by investors. I walked into employment wondering why investors were not interested in too much of the sociological and environmental information. It became obvious that when investors cue into aspects of mining prospects, the last things they consider are usually these topics of the people and the environment. Their investigation usually

concludes with simple questions like “were there any incidents of death in this regional among peer miners?”, “Was your company shut down for extended periods due to environmental violations?”, “Do you have plans of a community outreach program in place?”. The investors had 5 general topics they were interested in. The management team, the finances, the geology, the political regime, and their own sentiment on the commodity’s market. The task became trying to separate things that can be quantified and things that were specific to a broker’s opinion.

A broker’s sentiment on the gold market is subjective. The management teams are quantifiable but are too robust to consider for one thesis but cannot be neglected a large influence. This allows us to focus on the finances, geology, and political schemes that are specific to regions. This line of thinking lead me to investigate other reportable data that changes based on jurisdiction, thus the use of Legal, Environmental, and Sociological data. The MIQ already begins deviating from an investor’s procedure by drawing focus to these topics.

We are investigating reasons as to why these negative correlations exist and these can be traced throughout the entire methodology. The initial process of picking topics to focus on already deviates from a natural resource investor’s procedure. After that we wanted to pick a data set of companies that had enough in common to compare these attributes. The process of picking a commodity, company type, listing exchange, and capitalization range allowed us to do this. The errors lie in the number of companies chosen. A sample set of every listed company within this niche would provide a more reliable data set. Ideally these companies would be separated by their jurisdiction after the capitalization range so the regionally reliant data points are the same for each group.

Once we chose our data sets we identified the data sources that would provide the data. Although SNL Metals, Fraser Institute, SEDAR, and corporate reports are reliable information, they do not represent all the data that can be allocated to a mining company in our sample set. This absence of data provides an outlet for error as we attempt this comparison. In addition to this, not every company provides enough information to the public to fulfill every data point

within the MIQ database. The MIQ is designed to be filled out and when a company does not provide enough information about their project, they are missing potential points from lack of evidence. It is not that their company's prospect does not have a Net Present Value, it is that they did not provide enough information to do a sensitivity analysis. This lack of fulfilling an industry standard is enough to exclude their points from the analysis and as a result their score will drop.

The data processing methods used for from the data sources possess their own possibilities for flaws. I used the slopes of financial metrics to compare these company's statements through time. I do believe this is the best way to analyze these companies but it becomes another avenue for error when we have outlying years by companies. For instance of we are tracking a company's Net Income throughout the years, and they have 4 consecutive years of a negative slope but one stellar year that forces the slope into positives, we can argue that the year is reliant on a rare occurrence. Although 75% of the data points had a positive correlation to the normalized QMV, there were only 3% of the data points that had a correlation over 75%.

The processing method for the corporate data skews data from unreported sensitivities to gold price. The company that lacks reporting is penalized within the MIQ for the absence of these but does not represent the health of their prospect, instead their lack of organization.

The processing method for the Fraser data used the addition of the positive responses less the negative responses. The Fraser data fostered the least correlative data and I believe this is for a few reasons. Blame can be placed on the processing methods itself but considering this was a uniform method for all companies this is likely not the case. Reasoning for these discrepancies can be re-traced to the original discussion on a broker's focus. Broker's usually ignore these types of data sets because they assume they are inherently flawed. The data is based off of management teams providing answers to a survey. One could argue that these teams have ulterior motives to over- or under-sell the regions they are working for investment purposes. In addition to this sentiment, a company's world class deposit does not change if they make a

discovery in Armenia. If our healthiest company has a prospect in the worst jurisdiction, their corporate profile may not reflect this which is why we tend to have negative correlations with our Fraser data. For example, Meadow Bay Corporation was considered the worst company in our data set according to normalized QMV. This company ended up having the best rating for 4 of the 6 suites. These suites were heavily reliant on the Fraser data. When inspecting these companies we looked at the location of their flagship prospects in order to pick a jurisdiction. Meadow Bay's property happened to be in the state of Nevada, which obviously renders a very safe place for sociological, environmental, political and legal attributes. Despite not having a healthy company, they have the healthiest regional data. The lack of analysis for every prospect in their portfolio is another influence on error as we had to cue into their flagship property.

The weighting scheme becomes the last suspect for analysis flaws as we work through the methodology. The RAW scheme gave us a starting point to improve from which was achieved by the MIQ weighting. The 61.6% correlation of MIQ compared to the -12.8% of the RAW is not reason to label the MIQ as correct. The MIQ is definitively more effecting than an equal comparison but it also opens the gates for further investigation. In order to have a linear regression model with perpetually improving accuracy we would want to run a Monte Carlo sequence of every data point, weighting scheme, and normalized QMV.

The limits of this experiment become obvious after working through it and noticing the discordant information relative to the normalized QMV which will be discussed in the Further investigation section.

Chapter 4: Further Investigation

The magnitude and nature of this experiment leaves a majority of the work to further investigation. Our experiment had 3 basic components. Identifying sample set, identifying data points, and applying weightings for the data points.

Ideally we would have multiple analyses for different sample sets. This framework can be translated to any commodity, for any company types, for any listing market, and any range of market capitalizations. I personally would like to see a larger sample set represented or possibly even a case study of the entire junior gold mining-TSX listed company.

Next we can think about the data points we selected. Collecting and analyzing 51 data points for 8 companies is not sufficient for a comprehensive view of a company. This allows a lot for space for innovation for identified data points and using correlation data to elaborate. For example our environmental suite was 1 data point for the entire suite compared to financial data with 32. This leverages too much on the score of 1 data point and as a result detracts from the credible of the suite. We can also consider the absence of data points as a large variable in credibility. After working with Sprott Global Resource investments for 2 years it became apparent that one of the largest contributors to a successful venture is the management team. I believe management is quantifiable and can be put through the same processing methodology used for this experiment. I started writing what would have to be identified for each management team to be normalized and added as a separate Suite (table 4.1).

Table 4.1: Management data points to for further investigation

President/CEO/Founder
Documented Expertise (Professional Focus)
Years managing company
Prior mining employers

% Equity ownership
Vice President of Exploration
P.Geo or P.Eng
Professional years in mining career
Professional years with current commodity deposit type
Made a discovery with current commodity deposit type
Prior mining employers
% Equity ownership
Exploration Manager
P.Geo or P.Eng
Documented Expertise (Professional Focus)
Professional years in mining career
Professional years with current commodity deposit type
Made a discovery with current commodity deposit type
Prior mining employers
% Equity ownership
Vice President of Engineering
P.Geo or P.Eng
Documented Expertise (Professional Focus)
Professional years in mining career
Professional years engineering in current commodity deposit type
Prior mining employers
% Equity ownership
Director of Mine Development
P.Geo or P.Eng
Documented Expertise (Professional Focus)
Professional years in mining career
Professional years developing in current commodity deposit type
Prior mining employers
% Equity ownership
Lands / Environmental Manager
P.Geo or P.Eng
Professional years in mining career
Years experience with current jurisdiction permitting and regulation
Prior mining employers
% Equity ownership

Company staffing is a relevant parameter in regards to success or failure of a mining company. Each company's staff must be researched to identify their past education and work

experience. It is necessary however to award quality points to staff members higher up in corporate positions that have a history of successful growth and company development. If a company's leadership has historic failure their MIQ will respond negatively.

The mining industry is financially immense with a plethora of occupations that operate the sector. Among which are management and administrative, machinery operators, construction, environmental, academic and research, surveying, executive, engineering, auxiliary staff and safety, health and safety, chemical analyst, chief technical officers, maintenance and mechanical, technicians, marketing and commercial, geologists, accounting, human resources, metallurgists, and auditing and legal occupations. (http://www.infomine.com/careers/) It is understandable to think that within one mining venture a company is hiring someone to account for one of these responsibilities. Despite how large this sector is, experienced and proven individuals and enterprises have developed notoriety for their successes. Teams are specifically designed to be consulted out for jobs they have proven knowledge in. As a result a company staffing parameter suite can be established to quantify executives, associates, and consultants based past experience, industry regulations, or no contest based irrelevance of both. In which case the weighting of such questions would be distributed among remaining parameters.

This project will be an on-going investigation trying to make sense of the dynamic junior gold market. In regards to the weighting schemes used, the RAW and MIQ worked to prove that various weightings will correlated differently to a know market valuation of companies, but it is not optimized. Optimization comes after identity of new data points, dismissal of useless ones and eventually running a Monte Carlo analysis on the various weights for data points and suites. Once we have reached this I have absolute faith that futile junior mining companies will not be invested in.

Chapter 5: Conclusions

The purpose of the experiment was to provide a quantitative method to replace the due diligence of a resource investment broker. The task comes with identification of contributing data points and providing weightings of the data to reach a final score for a junior mining company. We know each company's market rank based on their Quoted Market Value which provides our independent variable for our correlation. The weightings were the titled the RAW and MIQ weightings. RAW gives each of the 6 suites an equal contribution to the total RAW score for the company along with equal contributions of each data point that sum to the suite's score. The MIQ weighting scheme becomes our exponential group as each data point within each suite has unequal contribution weightings and each suite has its own weighting towards the collecting MIQ score. We are able to calculate a correlation coefficient of the RAW and MIQ weightings to the QMV to determine significance of our results.

The RAW scores had a correlation coefficient of -12.1% where the MIQ weighting scheme had a correlation coefficient of 61.6%. The MIQ provides a better correlative weighting scheme. The collective scores provide a broad view of the significant correlations made within this experiment. Each data point and each parameter suite has its own correlation to the Quoted Market Value.

The Financial suite has the most positive correlation coefficients to normalized QMV with 75% of data points positively correlating. The Geological, Metallurgical and Market Leveraging suite has 60% of its data points positively correlating to the normalized QMV. One-third of the political data points positively correlated and 20% of sociological and regional data points positively correlated. The Legal and Environmental parameter suites were devoid of data points that positively correlated to the normalized QMV.

When looking at individual data sources we find that the SNL Metals trend data had 75% of its' data points with positive correlations to the normalized QMV. The Data provided by corporate reports for each corresponding company had 100% of the data points produce a

positive correlation. Only 14% of the data points acquired from the Fraser institute had positive correlations.

It is important to analyze the correlation coefficients for individual data points. This allows us to deduce what may or may not work in the future where focusing on data point selections. We know that the financial data from SNL Metals had the most correlative data of all of our data sources. We see 8 data points with negative correlations to the QMV (Table 5.1).

Table 5.1: SNL Metals Data with negative correlation coefficient to normalized QMV

SNL Metals Data Point	Correlation Coefficient
Cash Flow: Depreciation and Amortization	-35%
Price/Book (%)	-25%
Current Assets	-30%
Total Assets	-8%
Tangible Assets	-8%
Operating Revenue, Net	-18%
Cash Flow from Investing Activities	-38%
Return on Invested Capital	-16%

Depreciation is the decrease in asset value of tangible assets where amortization is the decrease in asset value for tangible assets. We can consider physical assets such as construction equipment and tangible assets. We can consider the intangible as bond and equity ownership by the company. It is no surprise that these two may not be correlative to the QMV as each company will have a varying array of these assets with different valuations. Whether or not a company is better than the next will not be determined by how much their assets have depreciated over time.

Price/Book ratio is the current price of a market share divided by the book value of that quarter's share. This can be non-correlative to a company's QMV as each company will have different book values at different quarters. In other words, the book value of the share does not represent the worth the market has placed on the share.

Current Assets are the assets that can be expected to be liquidated within a year. This will usually have a poor correlation as the each company has to liquidate assets at different times. If

a company needs cash to keep the lights on they will have a higher Current Assets total. This is not representative of the health of the company.

Total assets are an amalgamation of all tangible and intangible assets. As a result we would not expect a correlation to QMV as each company's willingness to possess construction equipment or invest with capital will be subjective per company.

The Tangible Assets data was not correlative with QMV for the same reason total assets was not correlative. Companies will purchase tangible assets as necessity sees fit. As a result, regardless of these companies being in the same relative stage of development, not every company purchases the equipment they need. These companies are known to hire consultant crews that have the materials so they don't have to worry about depreciation.

Net Operating revenue is another data point that relies heavily on a company's stage. This is an accounting of sales made by the company. If a company was producing from 2011 to 2012 and since has stopped producing during this period of gold price decline, they are less likely to have a positive slope for our analysis. This lack of concordant operating revenue from year to year means we will dive dissociations between QMV and new revenue.

Cash flow from investing activities and Return on Invested Capital were the least likely to have a positive correlation in my opinion as it relies on performance of underlying investments. Some companies use their capital to invest, some use it to buy equipment, and as a result of this varying mantra on what to do with capital we see a negative correlation between these two data points and the QMV.

The Fraser data had the least correlative data points of all the sources provided. Only 14% of the data points had a positive correlation to the QMV leaving us with 14 of the 17 data points with negative correlations (Table 5.2). This can be attributed to a lot of variables but two stick out in my mind. The Fraser data is an amalgamation of management team opinions on particular jurisdictions commonly visited by mining companies. Although we prefer to have the data correlation we have to understand that jurisdiction has little influence on mismanagement of a junior mining company. Whether or not a country has a great political stability may not lead

investors to invest in a company, thus increasing their QMV. It becomes apparent when we take extreme examples of company values versus jurisdiction. We can look at junior mining companies that have failed in the United States despite having the greatest Fraser scores and with the same respect we can view successful projects in remote regions with poor Fraser scores.

Table 5.2: Fraser Data points with negative correlation coefficient to normalized QMV

Fraser Data Point	Correlation Coefficient
Mineral Potential, Assuming Current Regulation / Land Use Restrictions	-20%
Mineral Potential, Assuming Policies Based on Best Practices (i.e. world class regulatory environment, highly competitive taxation, no political risk or uncertainty, and a fully stable mining regime)	-0.3%
Availability of Labor and Skills	-60%
Uncertainty over which Areas will be Protected as Wilderness, Parks or Archeological Sites	-64%
Quality of Infrastructure (includes access to roads, power availability, etc.)	-18%
Socioeconomic Agreements/Community	-12%
Political Stability	-18%
Taxation Regime (includes personal, corporate, payroll, capital, and other taxes, and complexity of tax compliance)	-36%
Uncertainty Concerning Environmental Regulations	-47%
Uncertainty Regarding the Administration, Interpretation, and Enforcement of Existing Regulations	-38%
Regulatory Duplication and Inconsistencies (includes federal/provincial, federal/state, inter-departmental overlap, etc,)	-42%
Legal System (legal processes that are fair, transparent, non-corrupt, timely, efficiently administered, etc.)	-23%
Uncertainty Concerning Disputed Land Claims	-39%
Labor Regulations/Employment Agreements and Labour Militancy/Work Disruptions	-40%

The correlations of particular data points are not always relevant to the quoted market value which is why we needed various weighting schemes to ultimately deduce what the proper weighting formula is. When we looked at our two weighting schemes for RAW and MIQ contribution weightings we clearly see that have unequal weighting can be used for more correlative data. This is logical as we try to emulate a resource investment broker's due diligence. They do not value sociological aspects equally with financial aspects and we can see evidence as to why when we look at the RAW score versus the MIQ scores.

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Glossary

Finance:

Average Diluted Shares (actual): Average shares used to calculate diluted EPS

Basic EPS after Extra: Basic earnings per share, after extraordinary items if applicable.

Cash Flow from Investing Activities: Cash flow from investing activities is an item on the cash flow statement that reports the aggregate change in a company's cash position resulting from any gains (or losses) from investments in the financial markets and operating subsidiaries and changes resulting from amounts spent on investments in capital assets such as plant and equipment. When analyzing a company's cash flow statement, it is important to consider each of the various sections which contribute to the overall change in cash position. In many cases, a firm may have negative overall cash flow for a given quarter, but if the company can generate positive cash flow from business operations, the negative overall cash flow may be a result of heavy investment expenditures, which is not necessarily a bad thing.

Cash Flow from Operating Activities: Cash flow from operating activities (CFO) is an accounting item indicating the money a company brings in from ongoing, regular business activities, such as manufacturing and selling goods or providing a service. Cash flow from operating activities does not include long-term capital or investment costs. It does include earnings before interest and taxes plus depreciation minus taxes.

Common Shares Outstanding (actual): Outstanding shares refer to a company's stock currently held by all its shareholders, including share blocks held by institutional investors and restricted shares owned by the company’s officers and insiders. Outstanding shares are shown on a company’s balance sheet under the heading “Capital

Stock." The number of outstanding shares is used in calculating key metrics such as a company's market capitalization, as well as its earnings per share (EPS) and cash flow per share (CFPS).

Current Assets: Current assets are balance sheet accounts that represent the value of all assets that can reasonably expect to be converted into cash within one year. Current assets include cash and cash equivalents, accounts receivable, inventory, marketable securities, prepaid expenses and other liquid assets that can be readily converted to cash.

Depreciation and Amortization: Amortization is the decrease in value of an intangible asset or assets over time while depreciation is the decrease in value of a tangible assets or assets over time. Thus, amortization and depreciation expense is the net decrease in assets, both tangible and intangible.

EBITDA before Capital Expense/ Interest Expense: Earnings before interest, tax, depreciation and amortization excluding capital and interest expenses.

EBITDA/ Interest Expense: The EBITDA-to-interest coverage ratio is a ratio that is used to assess a company's financial durability by examining whether it is at least profitably enough to pay off its interest expenses. A ratio greater than 1 indicates that the company has more than enough interest coverage to pay off its interest expenses.

EBITDA/ Share: Earnings before interest, income taxes, depreciation and amortization, calculated on a per-share basis.

EBITDA: Earnings before interest, tax, depreciation and amortization (EBITDA) is a measure of a company's operating performance. Essentially, it's a way to evaluate a company's performance without having to factor in financing decisions, accounting decisions or tax environments.

Institutional Ownership (%): Institutional ownership refers to the ownership stake in a company that is held by large financial organizations, pension funds or endowments. Institutions generally purchase large blocks of a company's outstanding shares and can exert considerable influence upon its management represented as a percentage.

Long-term Debt/ Book Capital: The long-term debt to capitalization ratio is a ratio showing the financial leverage of a firm, calculated by dividing long-term debt by the amount of capital available. A variation of the traditional debt-to-equity ratio, this value computes the proportion of a company's long-term debt compared to its available capital. By using this ratio, investors can identify the amount of leverage utilized by a specific company and compare it to others to help analyze the company's risk exposure as generally, companies that finance a greater portion of their capital via debt are considered riskier than those with lower leverage ratios.

Market Capitalization: Market capitalization is the total dollar market value of all of a company's outstanding shares. Market capitalization is calculated by multiplying a company's shares outstanding by the current market price of one share. The investment community uses this figure to determine a company's size, as opposed to sales or total asset figures.

Quoted Market Value: The last price multiplied by the number of outstanding shares. For the S&P/TSX index, the QMV is based on float shares, not on total outstanding shares. Float shares are total outstanding shares less any control block position, as defined by the Standard & Poor's index methodology.

Net Free Cash Flow Yield: The free cash flow yield is an overall return evaluation ratio of a stock, which standardizes the free cash flow per share a company is expected to earn against its market price per share. The ratio is calculated by taking the free cash flow per share divided by the share price.

Net Free Cash Flow: Free cash flow (FCF) is a measure of financial performance calculated as operating cash flow minus capital expenditures. Free cash flow (FCF) represents the cash that a company is able to generate after laying out the money required to maintain or expand its asset base. Free cash flow is important because it allows a company to pursue opportunities that enhance shareholder value. Without cash, it's tough to develop new products, make acquisitions, pay dividends and reduce debt. FCF is calculated as: EBIT(1-Tax Rate) + Depreciation & Amortization - Change in Net Working Capital - Capital Expenditure. It can also be calculated by taking operating cash flow and subtracting capital expenditures.

Net Income before Taxes: Net income is a company's total earnings (or profit). Net income before taxes is calculated by taking revenues and adjusting for the cost of doing business, depreciation, interest, and other expenses without account for taxes.

Net Income: Net income (NI) is a company's total earnings (or profit). Net income is calculated by taking revenues and adjusting for the cost of doing business, depreciation, interest, taxes and other expenses. This number is found on a company's income statement and is an important measure of how profitable the company is over a period of time. The measure is also used to calculate earnings per share.

Net Operating Profit After Tax: Net operating profit after tax (NOPAT) is a company's potential cash earnings if its capitalization were unleveraged – that is, if it had no debt. NOPAT is frequently used in economic value added (EVA) calculations. It is calculated as: NOPAT = Operating Income x (1 - Tax Rate). NOPAT is a more accurate look at operating efficiency for leveraged companies, and it does not include the tax savings many companies get because of existing debt.

Number of Institutions: See definitions for ‘Number’ and ‘Institutions’ separately.

Operating Revenue Growth: Operating revenue is revenue (sales) generated from a company's day-to-day business activities, which means revenue posted from selling the company's products and services. A retailer, for example, produces revenue through inventory sales, and a doctor derives revenue from consulting with patients. Operating revenue is important for a business to remain viable, because these sales are sustainable from one year to the next.

Operating Revenue, Net: Operating revenue is revenue (sales) generated from a company's day-to-day business activities, which means revenue posted from selling the company's products and services. A retailer, for example, produces revenue through inventory sales, and a doctor derives revenue from consulting with patients.

Price/Book (%): The price-to-book ratio (P/B Ratio) is a ratio used to compare a stock's market value to its book value. It is calculated by dividing the current closing price of the stock by the latest quarter's book value per share. Also known as the "price-equity ratio". A lower P/B ratio could mean that the stock is undervalued. However, it could also mean that something is fundamentally wrong with the company. As with most ratios, be aware that this varies by industry.

Return on Invested Capital: Return on invested capital (ROIC) is a profitability ratio. It measures the return that an investment generates for those who have provided capital, i.e. bondholders and stockholders. ROIC tells us how good a company is at turning capital into profits.

ROAA: Return on average assets (ROAA) is an indicator used to assess the profitability of a firm's assets, and it is most often used by banks and other financial institutions as a means to gauge financial performance. ROAA is calculated by taking net income and

dividing it by average total assets. The final ratio is expressed as a percentage of total average assets.

ROACE: A financial ratio that shows profitability compared to investments made in new capital. "Return on average capital employed" is calculated as: Average Total Assets - Average Current Liabilities. Total Assets - Current Liabilities = Capital Employed. It differs from the "return on capital employed" (ROCE) calculation, in that it takes the average of the opening and closing capital for a period of time, as opposed to only the capital figure at the end of the period.

ROAE: Return on average equity (ROAE) is an adjusted version of the return on equity (ROE) measure of company profitability, in which the denominator, shareholders' equity, is changed to average shareholders' equity. Typically, return on average equity refers to a company's performance over a fiscal year, so the average-equity denominator is usually computed as the sum of the equity value at the beginning and end of the year, divided by two.

Tangible Assets: Tangible assets include both fixed assets, such as machinery, buildings and land, and current assets, such as inventory. The opposite of a tangible asset is an intangible asset. Nonphysical assets, such as patents, trademarks, copyrights, goodwill and brand recognition, are all examples of intangible assets.

This ratio also gives some idea of whether you're paying too much for what would be left if the company went bankrupt immediately.

Total Assets: The basic accounting equation states that assets = liabilities + stockholders' equity. In the accounting industry, assets are defined as anything that a business owns, has value, and can be converted to cash. Assets are broken down into two main categories. These two categories are current assets and noncurrent assets.

Total Capitalization, at Book Value: The total long-term debt and all types of equity of a company that constitutes its capital structure

Total Debt/ Total Equity (x): Debt/Equity Ratio is a debt ratio used to measure a company's financial leverage, calculated by dividing a company's total liabilities by its stockholders' equity. The D/E ratio indicates how much debt a company is using to finance its assets relative to the amount of value represented in shareholders' equity.

Total Equity/ Total Assets: The shareholder equity ratio determines how much shareholders would receive in the event of a company-wide liquidation. The ratio, expressed as a percentage, is calculated by dividing total shareholders' equity by total assets of the firm, and it represents the amount of assets on which shareholders have a residual claim. The figures used to calculate the ratio are taken from the company balance sheet.

Total Equity: To calculate company equity, add the values for the total current assets and long-term assets. Then, subtract the values of total current liabilities and long-term liabilities. An alternative calculation of company equity is the value of share capital and retained earnings less the value of treasury shares.

Working Capital: Working capital is a measure of both a company's efficiency and its short-term financial health. Working capital is calculated as: Working Capital = Current Assets - Current Liabilities

Economic Geology:

CIM Definition Standards on Mineral Resources and Mineral Reserves

The new version includes changes to maintain compatibility with the new version of National Instrument 43-101 (NI 43-101), which is expected to become law in 2011. The

Standing Committee on Reserve Definitions has completed this work. The Canadian Securities Administrators (CSA) have always referenced the definitions and categories of Mineral Resources and Mineral Reserves used in NI 43-101 to CIM Definition Standards for Mineral Resources and Mineral Reserves. In October 2010, securities staff agreed that the new version of NI 43-101 could be modified to reference CIM Definitions for pre-feasibility and feasibility, if CIM inserted these definitions before December 2010.

In 2011, the CIM Standing Committee on Reserve Definitions plans to review all CIM definitions and consider, where appropriate, the integration of CRIRSCO "Core Definitions" into *CIM Definition Standards on Mineral Resources and Mineral Reserves*.

Inferred Mineral Resource: An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration. An Inferred Mineral Resource is based on limited information and sampling gathered through appropriate sampling techniques from locations such as outcrops, trenches, pits, workings and drill holes. Inferred Mineral Resources must not be included in the economic analysis, production schedules, or estimated mine life in publicly disclosed Pre-feasibility or Feasibility Studies, or in the Life of Mine plans and cash flow models of developed mines. Inferred Mineral Resources can only be used in

economic studies as provided under NI 43-101. There may be circumstances, where appropriate sampling, testing, and other measurements are sufficient to demonstrate data integrity, geological and grade/quality continuity of a Measured or Indicated Mineral Resource, however, quality assurance and quality control, or other information may not meet all industry norms for the disclosure of an Indicated or Measured Mineral Resource. Under these circumstances, it may be reasonable for the Qualified Person to report an Inferred Mineral Resource if the Qualified Person has taken steps to verify the information meets the requirements of an Inferred Mineral Resource.

Indicated Mineral Resource: An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve. Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project.

An Indicated Mineral Resource estimate is of sufficient quality to support a Pre-Feasibility Study which can serve as the basis for major development decisions.

Measured Mineral Resource: A Measured Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve. Mineralization or other natural material of economic interest may be classified as a Measured Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such that the tonnage and grade or quality of the mineralization can be estimated to within close limits and that variation from the estimate would not significantly affect potential economic viability of the deposit. This category requires a high level of confidence in, and understanding of, the geology and controls of the mineral deposit.

Appendix A

TSX listing requirements:

Financial Statements

A reporting issuer must file annual financial statements prepared in compliance with Canadian generally accepted accounting principles, with comparative figures, if applicable, which must be accompanied by an auditors' report. The annual financial statements and auditors' report must be filed with the relevant securities commission within 90 days of year end for non-venture issuers and within 120 days for venture issuers.

A reporting issuer must also file interim financial statements. The interim financial statements must include a balance sheet as at the end of the interim period and a balance sheet as at the end of the immediately preceding fiscal period, income and cash flow statements for the most recently completed three month period and year-to-date results, with comparative figures, and notes. The interim financial statements are due within 45 days of the interim period for non-venture issuers and within 60 days for venture issuers. For many companies, the Audit Committee will require that auditors to perform an interim review of these financial statements. If an auditor has not performed a review, the interim financial statements must be accompanied by a notice indicating that the financial statements have not been reviewed by an auditor.

Both the interim and annual financial statements must be approved by the Board of Directors. The Board may delegate this responsibility to the Audit Committee.

Management's Discussion and Analysis ("MD&A")

A reporting issuer must file its annual and interim financial statements with an MD&A. The MD&A is a narrative explanation, through the eyes of management, of how the company performed during the period covered by the financial statements, and of the company's financial condition and future prospect. The MD&A should complement and supplement the disclosures in the financial statements and must be approved by the Board of Directors. The Board may delegate this responsibility to the Audit Committee.

The objective of the MD&A should be to improve a company's overall financial disclosure by giving a fair and balanced overview of the company's results of operating and financial condition. The MDA would include the following disclosures:

- A summary of the overall performance of the company, including trends, capital commitments and uncertainties and risks effecting the business

- An analysis of operating results comparing the current year to prior year, along with an assessment of recently completed quarters
- A discussion on liquidity, compliance with covenants and capital resources
- Any off-balance sheet arrangements
- Transactions with related parties
- Critical accounting estimates
- Changes in accounting policies including initial adoption
- Financial instruments

Annual Information Form ("AIF")

The AIF must be filed within 90 days of the entity's fiscal period, and includes some of the disclosure requirements normally found in a long-form prospectus. The purpose of the AIF is to describe the business, its operations and prospects, risks and other external factors that could directly impact the company. The AIF should also include a general description of its capital structure, the market for its securities, and an overview of its directors and officers. Venture issuers are exempt from this requirement.

Material Changes

A purpose of disclosure requirements is to provide all investors with relevant information about the business affairs of the company. Such a material change may include disclosure of a potential financing, acquisition, or change in management. A reporting issuer must file a release authorized by a senior officer disclosing the nature and substance of the material change, and within 10 business days, file a report with the relevant securities regulator containing similar information. We encourage management to obtain legal advice on what events or transactions are deemed to be material to the business.

Business Acquisition Report ("BAR")

If a reporting issuer completes a significant acquisition, it must file a business acquisition report within 75 days after the date of the acquisition. The purpose of the business acquisition report is to describe the significant business acquired and the effect of the acquisition on the business. An acquisition is deemed to be significant if it meets certain quantitative measures based on size of the assets, and the reporting issuer's net investment in the acquired business or income.

If the acquisition is considered significant, the business acquisition report must include audited financial statements of each business, interim financial statements of the acquired business for the most recently completed interim period after the date of the audited balance sheet and before the acquisition date, and pro-forma financial statements.

Certifications

Non-Venture reporting issuers are required to provide interim and annual certifications over disclosure controls and procedures ("DC&P") and internal controls over financial reporting ("ICFR"). The certifications are generally signed by the chief executive officer and the chief financial officer. The purpose of these certifications is to improve the quality, reliability and transparency of annual, interim and other information that reporting issuers have to file.

The certification requires the certifying officers to attest that the information that is disclosed by the company is fairly presented and contains no misrepresentations. In addition, they must certify that the disclosure controls and procedures and internal controls over financial reporting are designed and operating effectively. Further, they must disclose in their annual MD&A their conclusions about the effectiveness.

Given Venture issuers generally have few employees and limited financial resources, they are not required to certify on the design and operating effectiveness of DC&P and ICFR. However, they must still certify that the information that has been disclosed is fairly presented and contains no misrepresentation.

SEDAR

The above continuous disclosure documents can be found on SEDAR. The filings can be made directly by the company or a filing agent, acting on behalf of the company.

Vita

I was born on April 27th, 1990 at Winthrop Hospital in Long Island, New York. My father is the first generation American from Armenia and my mother emigrated to the USA from Colombia when she was 20 years old. My father is a geologist and as a result I have been surrounded by this science my entire life. I had always stuck with my father on his research projects helping to co-author scientific publications. I took his Geology 101 course at his university when I was 13 years and began working with him on his research. I co-authored my first scientific publication at 14 and have co-authored 5 publications on New York regional metamorphic structural geology as of 2016.

I had my first internship at a Mueser-Rutledge Consulting Engineers in 2009. I continued to study metamorphic structural geology during my Bachelor of Science at Hofstra University. After graduating I moved to the University of Texas at El Paso to further my education. During my stay there I began to shift my focus from subterranean geotechnical to economic geology. I began developing the idea for the MIQ to attempt to create industry standards for small mining ventures as a means to mitigate poor resource investments. After travelling to various investor conferences in Toronto, New York, and California I began introducing myself to Sprott Global Resource Investments founded by Rick Rule. This company specialized in providing due diligence for investments within a commodity based company. I received an internship with the company in 2014 while further refining which aspects to focus on that influence the success of a mining venture. After working with Sprott for 2 years I decided to come back to The University of Texas at El Paso to complete my thesis and graduate with a 4.0 GPA.

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This thesis/dissertation was typed by Jonathan Mickey Merguerian