Accession Capital Corp

**A PRAGMATIC METHOD OF APPROXIMATING THE MINIMUM COST OF EQUITY FOR JUNIOR OIL AND GAS FIRMS DURING PERIODS OF COMMODITY PRICE UNCERTAINTY**

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EXECUTIVE SUMMARY:

- For the 5 years prior to July 2008 the future of energy price stability has become increasingly uncertain. This uncertainty has caused very high levels of stock price volatility in the junior Oil and Gas (O&G) exploration and production firms.
- In light of these very high stock price variations, traditional methods of determining cost of equity capital are largely ineffectual.
- 50 of the largest O&G TSX-Venture firms are studied for return, volatility and applicability to the CAPM. Only six of these firms show Sharpe Ratios that exceed the Market Index.
- By observing the market benchmark price of risk, via the Sharpe Ratio, it is possible to determine what the minimal cost of equity should be for any O&G firm given its historic level of stock price volatility.
- While the proposed technique is particularly helpful for industries facing such uncertain future commodity prices, considerable judgment is required in translating historic statistics such as the 60 month Sharpe Ratio to future projections.

## OIL AND GAS INDUSTRY VOLATILITY

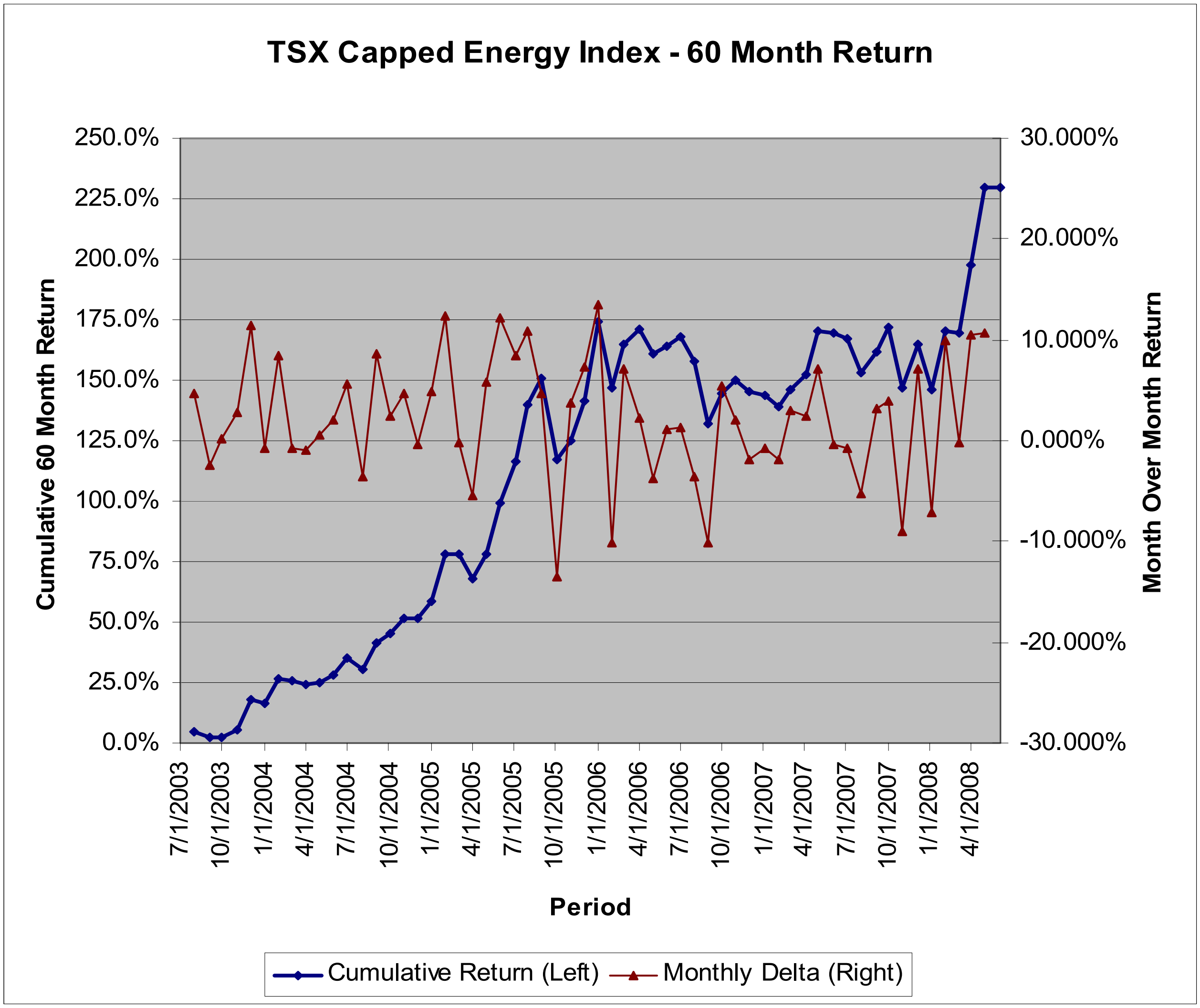
In recent times it is unlikely that any industry sector has been as volatile as the energy sector and particularly that of the junior to midsized[1] oil and gas Exploration and Production firms (E&P's). Looking over the past five years of energy prices there is little wonder why the market has been plagued with such tremendous volatility. In July of 2003 the spot price for a barrel of WTI was US$30.75 and by June of 2008 it had skyrocketed to US$133.88[2]. The Henry Hub NYMEX spot price per MMBTU of Natural Gas was US$5.29 in July of 2003 and five years later it had risen to

[1] Here we will be considering Oil and Gas firms with a market capitalization of approximately C$50 million to one billion. By Canadian standards this would be considered the junior to lower-midsize firms. If these firms were publicly traded on an American exchange they would more likely be considered micro-cap firms.

[2] Monthly spot average as reported by the EIA

$11.92. In the 18 years preceding 2003 the daily standard deviation, in nominal U.S. dollars for a barrel of WTI was $4.98. In the five and a half years following the start of 2003 that statistic has increased to US$25.15 (source data; EIA historical price files). Such dramatic change in world energy prices has attracted a great deal of capital into the smaller exploration and production Oil and Gas (O&G) companies. But this very same uncertainty over the long-term equilibrium of energy prices has permeated the entire industry and caused tremendous variability in daily stock prices. This variability is amplified in the junior players as most do not have the security of large proven reserves that the major firms do.

A quick examination of the past five years of the TSX Capped Energy Index, trading on the Toronto Exchange, demonstrates both just how volatile the energy sector has been and seemingly also how lucrative. The old adage that the efficient market only rewards risk-takers is clearly evident here given that the month-over-month return percentage undulates wildly above and below the 0.0% axis (the risk), and yet the five year return on the index is in excess of 225% (the reward).




So, the question becomes, 'In light of the past energy pricing uncertainty, how does one go about identifying a reasonable approximation of an expected cost of equity for the smaller O&G firms? Are any of the traditional 'cost of capital' approaches useful? The purpose of this paper is to find a pragmatic approach to approximating the cost of equity of just such a junior O&G firm in the face of energy price uncertainties. This purpose is best served by using real-world data and a sample of 50 of the largest O&G firms trading on the Toronto Venture Exchange was selected. The market capitalization ranged from C$46.6 million to C$1.072 billion[3]. Of the 50 firms in the sample, 35 had a full 60 months of trading history, five had between 36 and 59 months of trading data and the remaining 10 had less than 36 months. The distinction is important because beta regressions and

[3] As determined by market capitalization reported by the Toronto Stock Exchange as at March 31, 2008.

standard deviation volatility measures were calculated for the 36 and 60 month data histories. So, firms with less than 36 months of trading histories are not reported with betas. However, the annualized capital gains yield over the 60 month period, or, if not available, over the longest period of data available is reported for all fifty firms. Also the coefficient of determination (also known as the R-squared statistic) is reported for each 60 and 36 month beta calculation as an indication of the reliability of the beta regression.

## 50 Largest Oil and Gas Firms Trading on Toronto Venture Exchange in June 2008

Some month-end data compiled as at June 27, some June 30, 2008

| Root Ticker | Company Name | | Equity Market Cap as at March 31, 2008 (per TSX in millions C$) | Max. # of data months | Average volume of monthly shares traded in data months (Globe Investor data) | Annualized Yield* in that Period | 60 MONTH DATA: Beta: 60 month w S&P/TSX Index | 60 MONTH DATA: $R^2$: 60 month w S&P/TSX Index | 60 MONTH DATA: Volatility: Monthly standard deviation % over 60 months | 36 MONTH DATA: Beta: 36 month w S&P/TSX Index | 36 MONTH DATA: $R^2$: 36 month w S&P/TSX Index | 36 MONTH DATA: Volatility: Monthly standard deviation % over 36 months |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGP | Anglo Potash Ltd. | $ | 174.2 | 60 | 1,183,444 | 232.4% | 0.212 | 0.000 | 31.20% | 0.536 | 0.006 | 23.72% |
| AOI | Africa Oil Corp | $ | 119.7 | 60 | 116,751 | 62.1% | 1.459 | 0.059 | 18.31% | 1.048 | 0.035 | 18.36% |
| ARN | Arcan Resources Ltd. | $ | 62.4 | 32 | 1,010,480 | -26.8% | N/A | N/A | N/A | N/A | N/A | N/A |
| BFR | Buffalo Resources Corp | $ | 55.5 | 60 | 709,372 | 20.9% | -0.258 | 0.001 | 22.14% | 1.245 | 0.105 | 12.70% |
| BUK | Bridge Resources Corp | $ | 113.0 | 60 | 1,485,983 | 80.2% | 2.249 | 0.029 | 40.30% | 1.074 | 0.036 | 18.61% |
| CE | Canada Energy Partners Inc. | $ | 87.6 | 19 | 1,674,533 | 31.0% | N/A | N/A | N/A | N/A | N/A | N/A |
| CEN | Coastal Energy Company | $ | 262.4 | 34 | 1,444,985 | 61.2% | N/A | N/A | N/A | N/A | N/A | N/A |
| CHQ | Challenger Energy Corp. | $ | 120.6 | 31 | 666,554 | 45.6% | N/A | N/A | N/A | N/A | N/A | N/A |
| CKK | Cordy Oilfield Services Inc. | $ | 79.4 | 60 | 1,425,432 | 38.3% | 12.146 | 0.041 | 181.37% | 17.516 | 0.063 | 230.90% |
| CLN | Culane Energy Corp | $ | 145.9 | 60 | 408,497 | 53.2% | 0.637 | 0.012 | 17.98% | 1.236 | 0.049 | 18.44% |
| CNS | Canoro Resources Ltd. | $ | 169.5 | 60 | 3,712,512 | 15.4% | 2.172 | 0.075 | 24.13% | 1.700 | 0.069 | 21.37% |
| CXZ | Canext Energy Ltd | $ | 57.8 | 25 | 2,127,965 | -6.2% | N/A | N/A | N/A | N/A | N/A | N/A |
| CYR | Cirrus Energy Corporation | $ | 198.1 | 39 | 1,006,823 | 75.5% | N/A | N/A | N/A | 0.869 | 0.038 | 14.72% |
| DEJ | Dejour Enterprises Ltd. | $ | 108.7 | 60 | 2,638,718 | 99.7% | 2.597 | 0.081 | 27.68% | 3.045 | 0.274 | 19.19% |
| ENG | Energulf Resources Inc. | $ | 179.6 | 60 | 2,326,930 | 49.2% | -0.040 | 0.000 | 41.07% | -0.199 | 0.000 | 44.68% |
| EUG | Eurogas Corporation | $ | 120.8 | 60 | 978,526 | 24.6% | 2.020 | 0.077 | 22.15% | 1.530 | 0.169 | 12.29% |
| FO | Falcon Oil and Gas Ltd. | $ | 248.5 | 60 | 35,884,869 | 54.4% | 1.424 | 0.020 | 31.01% | 3.066 | 0.088 | 34.07% |
| GBE | Grand Banks Energy Corp | $ | 71.6 | 60 | 27,560 | 23.6% | 1.119 | 0.060 | 13.90% | 0.715 | 0.031 | 13.31% |
| GNO | Genoil Inc. | $ | 131.8 | 60 | 4,575,760 | 19.7% | -0.079 | 0.000 | 26.81% | 0.161 | 0.000 | 27.96% |
| GSA | Groundstar Resources Limited | $ | 70.6 | 60 | 1,000,045 | 37.6% | -1.143 | 0.015 | 28.21% | -2.204 | 0.066 | 28.25% |
| IAE | Ithaca Energy Inc | $ | 290.2 | 25 | 4,504,996 | 26.4% | N/A | N/A | N/A | N/A | N/A | N/A |
| KDK | Kodiak Energy Inc. | $ | 107.5 | 5 | 533,816 | 50.3% | N/A | N/A | N/A | N/A | N/A | N/A |
| LEY | Loon Energy Inc. | $ | 59.1 | 60 | 1,719,969 | 26.3% | 0.629 | 0.007 | 22.59% | 0.159 | 0.001 | 15.25% |
| MCF | March Resources Corp. | $ | 54.4 | 60 | 2,221,665 | 14.3% | 3.557 | 0.034 | 58.61% | -0.466 | 0.003 | 26.76% |
| MMT | Mart Resources Inc. | $ | 142.7 | 60 | 4,813,327 | 24.6% | 0.430 | 0.003 | 25.25% | 0.246 | 0.001 | 20.96% |
| MVN | Madalena Ventures Inc | $ | 63.4 | 17 | 1,737,965 | -30.2% | N/A | N/A | N/A | N/A | N/A | N/A |
| NKW | Naikun Wind Energy Group Inc. | $ | 101.1 | 60 | 530,010 | 80.2% | 3.155 | 0.071 | 36.03% | 2.240 | 0.038 | 38.17% |
| NRS | Norwood Resources Ltd. | $ | 50.7 | 60 | 3,327,121 | 68.2% | 2.454 | 0.041 | 36.84% | 2.670 | 0.048 | 40.26% |
| OEX | Orleans Energy Ltd. | $ | 167.2 | 42 | 1,828,220 | 12.7% | N/A | N/A | N/A | 1.216 | 0.074 | 14.74% |
| ORC | Orca Exploration Group | $ | 289.3 | 45 | 789 | 19.1% | N/A | N/A | N/A | -1.064 | 0.027 | 21.54% |
| OYL | CGX Energy Inc. | $ | 368.1 | 60 | 2,228,162 | 59.4% | 3.153 | 0.113 | 28.50% | 1.947 | 0.052 | 28.29% |
| PEF | Petroflow Energy Ltd. | $ | 58.5 | 60 | 75,822 | 77.2% | 2.338 | 0.025 | 45.21% | 4.346 | 0.164 | 35.47% |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POE | Pan Orient Energy Corp | $ | 469.7 | 60 | 2,077,375 | 109.2% | -3.447 | 0.017 | 79.32% | 2.547 | 0.168 | 20.53% |
| PRD | Pacific Rodera Energy Inc. | $ | 54.6 | 60 | 3,602,884 | 37.0% | 2.709 | 0.077 | 29.68% | 3.586 | 0.240 | 24.15% |
| RYD | Ryland Oil Corporation | $ | 218.8 | 60 | 1,742,914 | 190.0% | 2.923 | 0.014 | 75.72% | 3.596 | 0.041 | 58.36% |
| SCS | Second Wave Petroleum Ltd. | $ | 61.6 | 42 | 240,015 | -36.6% | N/A | N/A | N/A | -0.131 | 0.000 | 30.08% |
| SE | Stratic Energy Corporation | $ | 176.4 | 60 | 6,682,824 | 29.3% | 1.764 | 0.075 | 19.65% | 1.725 | 0.140 | 15.19% |
| SLG | Sterling Resources Ltd. | $ | 269.4 | 60 | 4,057,472 | 58.0% | 1.012 | 0.022 | 20.66% | 0.755 | 0.022 | 16.96% |
| SOR | Solana Resources Ltd. | $ | 400.3 | 60 | 6,450,001 | 86.8% | 3.399 | 0.081 | 36.28% | 2.147 | 0.106 | 21.79% |
| SQZ | Serica Energy PLC | $ | 250.2 | 60 | 1,577,950 | 32.7% | 1.720 | 0.055 | 22.26% | 0.914 | 0.115 | 8.91% |
| STP | Southern Pacific Rescources Corp. | $ | 75.2 | 60 | 2,059,427 | 79.5% | 6.938 | 0.037 | 110.13% | 9.083 | 0.078 | 107.31% |
| TGE | TG World Energy Corp. | $ | 52.1 | 60 | 2,104,403 | 59.7% | 3.317 | 0.031 | 57.41% | 1.364 | 0.050 | 20.05% |
| TTR | Terra Energy Corp | $ | 103.2 | 60 | 1,564,762 | 77.3% | 3.134 | 0.022 | 63.89% | 1.269 | 0.057 | 17.51% |
| TWO | Twoco Petroleums Ltd. | $ | 47.3 | 51 | 350,240 | 15.7% | N/A | N/A | N/A | 1.879 | 0.228 | 12.98% |
| TYK | Tanganiyika Oil Company | $ | 1,071.8 | 60 | 710,335 | 57.9% | 1.738 | 0.085 | 18.09% | 1.328 | 0.059 | 18.01% |
| WSR | WSR Gold Inc. | $ | 46.6 | 60 | 2,929,491 | 53.1% | 6.331 | 0.118 | 56.07% | 4.734 | 0.173 | 37.52% |
| WX | Wrangler West Energy Corp. | $ | 71.6 | 60 | 27,560 | 18.8% | 0.364 | 0.020 | 7.84% | 0.535 | 0.094 | 5.77% |
| WZR | Westernzagros Resrouces Ltd | $ | 414.9 | 8 | 26,430,173 | -28.9% | N/A | N/A | N/A | N/A | N/A | N/A |
| XE | Xemplar Energy Corp | $ | 193.3 | 60 | 4,727,117 | 112.2% | 3.700 | 0.056 | 47.65% | 4.055 | 0.093 | 43.81% |
| XEL | Xcite Energy Limited | $ | 67.2 | 8 | 1,984,031 | -13.9% | N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | | Average Monthly Volatility | | | | 40.68% | | | 30.97% |
| | | | | | Annualized Volatility | | | | 140.93% | | | 107.29% |

Some important observations become immediately apparent. The first is that, with an annual average volatility of 141%, the expected return on equity for firms in this group is likely to be very high relative to other industry sectors where stock price volatility may vary in the 20 to 30% range. The second observation is that on the whole the R-Squared statistics are unreliably low. As a result it is highly unlikely that any regressed Beta will be statistically dependable for use in deriving a cost of equity[a]. Confining our consideration to only the 60 month R-Squared, for example, we find there are only two with an R-Squared greater than 0.10 (namely OYL and WSR). If we accept these regressions at face value, then the OYL Beta is 3.153 and WSR is reported at 6.331. Application of the traditional Capital Asset Pricing Model (CAPM), assuming a long-term Market Risk Premium (MRP) of 5.70% and Risk-Free Interest Rate of approximately 4.1% as at June 30, 2008 would suggest:

Recall that the CAPM formula is:

$$k_e = R_f + \beta \times (MRP)$$

Where:

$k_e$ = the EXPECTED return on the levered equity[4]
$R_f$ = the appropriate Risk-free rate of return
$\beta$ = that security's specific Beta
MRP = the Market Risk Premium (i.e. the return the market is producing in excess of the risk-free rate)

Therefore:

$$\text{OYL: } k_e = 4.10\% + 3.153 \times 5.70\% = 22.07\%$$

$$\text{WSR: } k_e = 4.10\% + 6.33 \times 5.70\% = 40.18\%$$

In consideration of the fact that OYL and WSR show a *monthly* standard deviation of stock prices of 28.50% and 56.07% (i.e. 99% and 194% annualized), then an expected cost of equity of 22% and 40% could be considered quite conservative (in fact, too conservative, as we shall see). But even if the CAPM results for these stocks are accepted at face value, what of the rest of

[4] This presumed that the firm carried debt at the time the beta was regressed. If not, the resultant beta will naturally reflect an un-levered (i.e. no-debt) equity beta.

the junior O&G plays? How can a cost of equity be approximated for a group of firms where regressed data will so clearly not be reliable?

THE SHARPE RATIO

One solution to this question may be in using the Sharpe Ratio to set a lower bound upon the minimal level of return the market would expect on these highly volatile securities – and the remainder of this paper will describe why such an application would be both a reasonable and prudent course of action. The Sharpe Ratio is the relative proportion of a return differential and the volatility (i.e. standard deviation) of that differential. Most simplistically it can be thought of the measure that equates how much reward (i.e. return) a given investment provides for each unit of risk (i.e. volatility). Specifically, the form of Sharpe Ratio we will be concerned with is:

$$(R_i - R_f)^{5} / \sigma_i = \text{Sharpe Ratio}$$

Where;

$R_i$ = Rate of Return on Investment
$R_f$ = Risk-Free Rate of Return
$\sigma_i$ = Standard Deviation of Investment[6]

THE EX-POST SHARPE RATIO OF THE TORONTO STOCK EXCHANGE INDEX

For example, if we look back upon the 60 months performance of the Toronto Stock Exchange (TSE) Index, just prior to July 1, 2008, we will note that the annualized return on the index for that period was 14.88%. The Standard Deviation for the Index over that time was 10.535% annually. The average risk-free rate upon long-term Government of Canada Benchmark Bonds

[5] Professor Sharpe is quick to point out, in his 1994 *The Journal of Portfolio Management* article entitled "The Sharpe Ratio", that the numerator must be represented by a differential of rates. It is not sufficient to use just a single rate of return. The reason why is beyond the scope of this article, but centers upon the fact that the ratio is only theoretically applicable to a zero-dollar investment strategy (i.e. short the lower return security in order to buy long the higher). Throughout this paper the differential rate we will be concerned with is the investment in question less the risk-free rate.
[6] Technically it should be Standard Deviation of the Differential, or MRP of Investment. However, because the Standard Deviation of the risk free is always zero, the Investment and MRP have equivalent σ.

over that time period was 4.54%. Therefore, the 'ex-post' (meaning, backwards looking, and using historical data) Sharpe Ratio of the Index[7] would be:

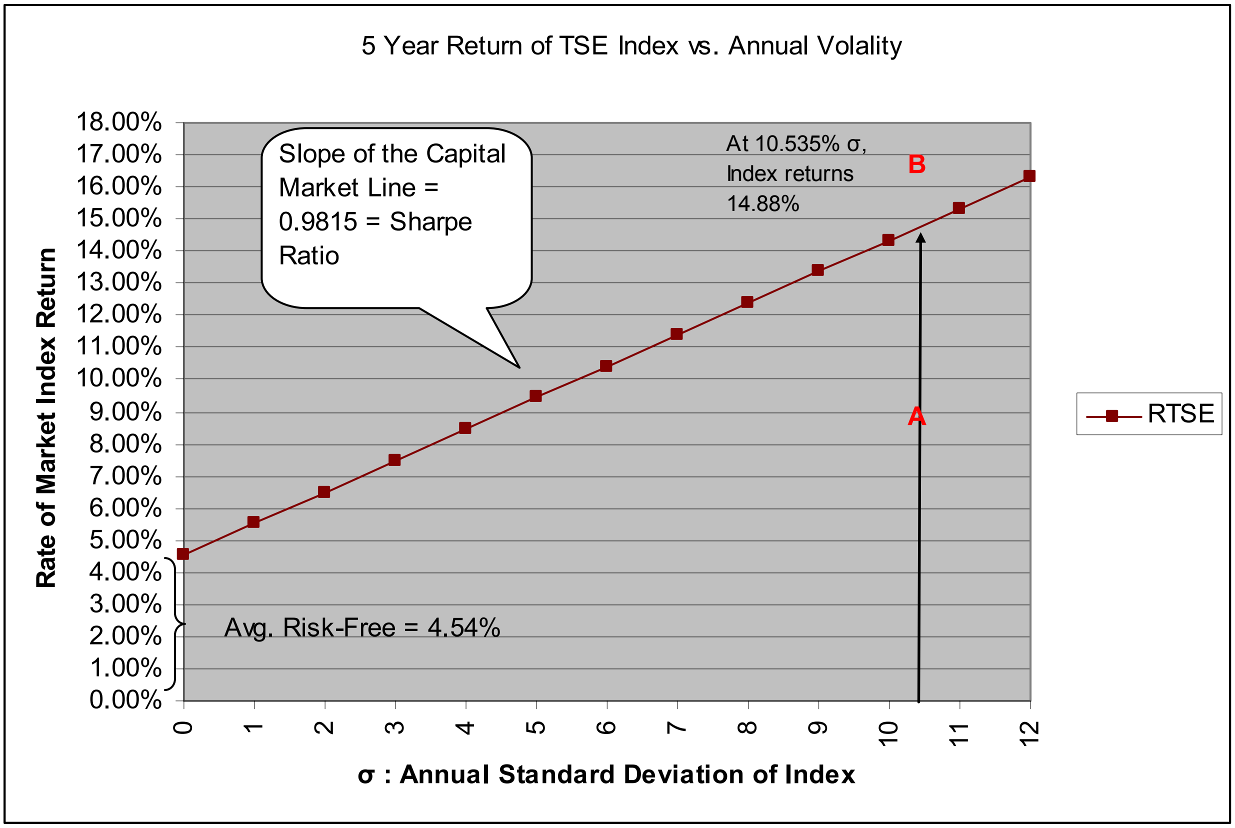
(14.88% - 4.54%) / 10.535% = **0.9815**

Note that the numerator represents the historical return of the Index in excess of the risk-free rate and is often referred to as the Market Risk Premium (MRP) … the rate of return the Market delivers in excess of the risk-free return.

So what the Sharpe Ratio is telling us is that, for every one percent of volatility in the Index, the Market, over the past 5 years, returned 98 basis points of reward. The 'price-of-risk' therefore is almost at a one-to-one ratio.

If we were to plot the results of the TSE risk/reward matrix average for the past five years, the following would result:

[7] This data was actually developed using month-over-month Index changes and monthly Bond yields, and then annualized.




With standard deviation represented on the horizontal axis and index return on the vertical, we can see that the Sharpe Ratio represents the slope of the line connecting the risk-free rate with the average return of 14.88% at a standard deviation of 10.535% (Anyone with a clear memory of 2nd year Finance will recognize the line as the Capital Market Line – CML). Note that the investment represented by Point A would have performed much worse than the Index, because the same degree of risk (Standard Deviation) has been incurred, but the annualized return was only 9%. Conversely, Investment B performed much better than the Index because, even though the risk was the same, the return generated was at 17% rather than just 14.88%.

THE EX-POST SHARPE RATIO OF FALCON OIL & GAS LTD.

Falcon Oil and Gas Ltd. (trading as FO on the venture exchange) was selected from the aforementioned list at random. With a low R-Squared (for both the 60 and 36 month stats), it is unlikely that a reliable CAPM cost of equity will be found. Moreover, the monthly average volume of shares traded represents a healthy 16% of the total float. This would indicate that the measure of volatility is a true reflection of market consensus – rather than the whim of just a few rogue traders. Further, the volatility and actual rate of return over the past 60 months have both been quite high for this firm (suggesting that other traditional measures of cost of equity will not provide reasonable results). The annualized volatility for this firm is 107.42%. The measured Sharpe Ratio, over the past 60 months, is 0.843. On the face of it, this means it would have been preferable, for the period of July 1, 2003 through June 30, 2008 to have invested fully in the TSE Index, rather than FO, because for every unit of risk incurred in the index, that returned 0.98 units of reward, whereas FO only returned 0.84[8]. The other way to express this relationship is to state that FO did not produce a sufficiently high enough return on equity, given its inherent risk profile. And, at least a portion of this shortfall can be measured.

We can, for example, ask ourselves what rate of return FO would have had to produce in order just to match the TSE Market Index Sharpe Ratio of 0.9815, given the inherent riskiness of FO. Consider again the variables of the Sharpe Ratio Formula:

$$(R_i - R_f) / \sigma_i = \text{Sharpe Ratio}$$

Substituting the known Index Sharpe Ratio, known average Risk-Free rate and known FO volatility gives us:

$$(R_{FO} - 4.54\%) / 107.42\% = 0.9815$$

And simple algebra then tells that $R_{FO}$ = **109.97%**

[8] Some may rally against the idea that the TSE Index outperformed FO – citing the obvious truth that the TSE only provided a 14.88% annual return during those five years whereas FO produced 54.4%. Certainly, with the absolute clarity of hindsight we would always choose to invest in the shares that produced the highest overall yield. However, without the omnipotent advanced knowledge of the outcome, it would have been apparent, as the five years progressed, that the Index was producing a higher return per each unit of risk (volatility) than was FO. Stated another way, the uncertainty over where FO would end up would have been much greater than where the Index could be predicted to go.

In order, therefore, for FO just to match the same proportionate risk/reward matrix that the TSE Index[9] was providing over this five year period, the FO return on equity would have had to achieve a *minimum* rate of approximately 110%. So, in contrast the actual 54.4% yield was only half of the results required.

DUPLICATING THE REQUIRED FO COST OF EQUITY VIA THE INDEX AND RISK-FREE BORROWING:

In order to show that the Market Index could produce a 110% annual return at volatility of 107.4% we are going to assume that the average investor can both lend and borrow funds at the same risk-free rate of return. The success of our argument is not dependent upon this assumption – but the math will be simplified and the required exposition greatly reduced if this one convenient assumption is allowed. Normally, of course, the cost of borrowing for any non-government debtor is higher than risk-free rate of lending.

Recall that the weighted average rate of return on the portfolio of any two investments is simply the proportionate amount of capital allocated to each investment. So, if an investor had, for example, $100 to invest and wished to split that equally between the TSE Index and a Risk-Free Bond, his ultimate portfolio return would be:

**50%:50% Portfolio:**

Rate of Return = ($50/100) x 14.88% + ($50/100) x 4.54% = 9.71%

Also, recall that the standard deviation of any risk-free asset is zero. This is because there is no variability in the underlying cash flows of this security – the principal and interest amounts are always known.

[9] The comparison between investing in the index and a single security would have been entirely moot 20 years ago, as no cost-effective means of matching the index would have then been possible. Now, however, ETF's and the like have made duplicating the returns on any index quite commonplace.

Therefore, the combined volatility of the 50/50 portfolio can again be found simply by calculating the weighted average of the two individual standard deviations[10]:

Volatility = ($50/100) x 10.535% + ($50/100) x 0.00% = 5.27%

**200%:-100% Portfolio:**

Rather than lending at the risk-free rate, this same investor could borrow $100 and invest the entire $200 in the Market Index. This would have the effect of increasing both potential returns and volatility:

Rate of Return = ($200/100) x 14.88% - ($100/100) x 4.54% = 25.22%

Volatility = ($200/100) x 10.535% - ($100/100) x 0.00% = 21.07%

So this example shows that, by borrowing at the risk-free rate and investing these proceeds into the Market Index (along with the original $100) has substantially increased the expected rate of return as well as the volatility[11]. Note, however, that the Sharpe Ratio, now measured at this new level of portfolio outcome, remains completely unchanged as the stand-alone Market Index:

$(R_i – R_f) / \sigma_i$ = Sharpe Ratio

(25.22% - 4.54%) / 21.07% = 0.9815

[10] This would not necessarily be the case in a portfolio of two (or more) risky securities. If the volatility of the two (or more) securities have a correlation coefficient other than zero, the volatility of the portfolio will not equate to the simple weighted average of the individual component securities. However, the risk-free asset has a volatility of zero, and is therefore not correlated with any other security.

[11] See Appendix A for a more in depth explanation of why borrowing increases volatility.

**FO Simulated Investment Using TSE Index and Borrowed Funds:**

Now, we ask ourselves what kind of expected return can be had using a portfolio of Borrowed Funds and $100 Original Capital invested in the Market Index such that a 107.42% annual volatility is incurred. This will expose us to the exact same level of risk as had we invested directly into the FO security.

Let B represent the amount of funds Borrowed.

Note that, in setting the desired level of volatility to 107.42%;

$$[(B + \$100)/100] \times 10.535\% - (B/100) \times 0.00\% = 107.42\%$$

And solving for B we find **B = $919.65** Therefore, borrowing $919.65 and investing this plus the original capital of $100 into the TSE Index will generate a risk exposure exactly equivalent to investing any principal amount into the FO shares.

And, the expected Rate of Return for this new portfolio will be:

Rate of Return = (($919.65 + 100)/100) x 14.88% - ($919.65/100) x 4.54% = **109.97%**[12]

From an ex post perspective then (when all outcomes are known with certainty), any average investor could have simulated the same level of risk-exposure incurred by the FO shares simply by borrowing a certain amount of funds (in a 9.1965 proportion to their own capital), and investing these funds into the Market Index and, after five years time, realized a 109.97% annual yield on their original capital (the $100 referenced above). This approximate 110% annual return must, therefore, represent the absolute lower bound on the expected FO cost of equity,

[12] Of course, for those that recognized the Sharpe Ratio conveyed the formula of the Capital Market Line as being Return = 4.54% + (0.9815 x $\sigma$) … and that the desired $\sigma$ of 107.42% could just be substituted into the formula to give a 109.97% return, this would have been much quicker. However, the full exposition of the Borrow and Invest in the Index portfolio theory has been provided to present a complete conceptual overview of the mechanics.

because no rational risk-adverse investor would accept less from a single risky security when they could achieve a higher yield by investing in a high-diversified index.

## SHARPE RATIO ONLY SETS A *MINIMUM* RATE OF RETURN

Applying the Sharpe Ratio in this manner **does not** provide a methodology for determining the *appropriate* cost of equity for the subject firm. It only highlights what should be considered the minimum rate of return any rational investor should accept for that equity. That is, if the Market Index is paying 98 basis points of return for every 100 basis points of volatility, why would any clear-thinking investor accept less? This logic is particularly appealing when one considers that, by investing in a highly-diversified market index proxy (say an Exchange Traded Fund), all non-systematic risk is diversified away and the investor is only then exposed to macroeconomic market changes. In contrast, investing in any individual security exposes one to both the system-wide macroeconomic risks (and rewards) as well as the very difficult to forecast company-specific (non-systematic) risks.

We have not addressed the possibility that our sample firm FO, perhaps should be compensating its investors at a 105, 110 or 120 basis point Sharpe Ratio – given the firm's specific risk circumstances. We have only observed that, if FO was to compensate its investors at the same unit-price-of-risk that the Market Index had, a much higher rate of return was required.

## USING EX POST METRICS AS A BASIS FOR EX ANTE PREDICTIONS

There are no benefits to predicting the past. Using historical data to determine that a given firm produced a 54% annual return when the risk-adjusted minimum should have been 110% is interesting – but not very useful. There must be implications that can be carried forward into the future.

If, for example, the Market Index is expected to continue to experience a 10.5% annual volatility and a MRP of approximately the same amount over the long-term predicable future, then it is reasonable to expect that a 98 basis point reward/risk minimum should be priced into the equity capital of every publicly traded firm. However the historical data would argue against this. The long-term (1926 to 2006) Equity Risk Premia of the S&P500 is 7.1%[13] Meanwhile the 1950 to July 2008 annualized standard deviation of the S&P500 has approximated 14.1%[14]. This would imply a long-term S&P 500 Sharpe Ratio of 0.5032 (7.1% / 14.1%).

Considering the Canadian historic data, the Long-Term MRP is estimated at 5.7% (1936 to 2007)[15] and the annualized standard deviation (based upon monthly closing data from 1956 to June 2008) has been 15.2%. This would suggest a more normalized long-term Sharpe Ratio of 0.375 (5.7% / 15.2%). Throughout this 52.5 year time period the annualized geometric rate of return has been 6.52%/year (including the risk-free return). Therefore, the past five years of market data (14.88% return and 10.535% volatility) has not been in keeping with the long term historic results and its applicability to future projection depends entirely upon how long the predictor believes these trends will continue or what they may change to.

Finally, there is an implicit assumption about past security volatility. We have measured the prior 60 monthly FO volatility to be 107.42% annually … and assuming that this level of variation continues on indefinitely, it is perhaps not unreasonable to believe that an annual cost of equity in the range of 110% should be expected. It is, however, unlikely that the degree of energy pricing uncertainly will remain as high in the future as has been experienced in the recent 5 years. Remember that the post 2002 WTI daily spot price standard deviation is a factor of 5 times larger than that of the preceding 18 years. At some point greater equilibrium in the energy markets will, in turn, cause the general level of volatility in the Junior Oil and Gas firms to return to more normal standard (although, these may always be higher than many other industries with more predicable cash flows).

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[13] As per Morningstar Inc. "Risk Premia Over Time: 2007" report, pg. 7
[14] Calculated from Month-End adjusted data
[15] As reported as the weighted average of the 1936 – 1969 MRP from Morningstar Inc. "Canadian Risk Premia Over Time Report 2007", pg. 6 and the 1970 – 2007 MRP from Morningstar Inc. "International Equity Risk Premia Report 2008", pg. 35

For example, assume that, as a group the long-term average *expected* (ergo, ex anti) annualized volatility of the 50 O&G firms was 60.0% (vs. the 140.97% recorded over the past five years). Also assume that the expected long-term go forward Sharpe Ratio on the TSE Index was 0.60 and the long-term risk-free rate was 4.0%. With these predictions, the minimum average cost of equity for this group of firms would be approximately 40%[16]. Under these conditions, the CAPM derived cost of equity for WSR of 40.18% above would seem appropriate. Conversely, if the market conditions of the past five years are expected to continue indefinitely into the future, and WSR will continue to experience an annual volatility of 194%, then a 40% cost of equity would be wholly inadequate.

## IMPLICATIONS FOR JUNIOR OIL AND GAS E&Ps

As a broad overview of the TSE-Venture Exchange Oil and Gas juniors, or at least the 50 largest that have been under consideration herein[17], we note that only six have produced a reward-to-risk return in excess of the TSE Composite Index, over the past 60 months [Namely, AGP[18], CYR, RYD, DEJ, XE and AOI as can be seen in the table below]. For the remaining firms with an annualized Sharpe Ratio less that the Index's 0.9815, these have underperformed the Market on a 'unit-of-risk' basis.

[16] Ri = 0.60 x 0.60 + .04 = 40.0%
[17] But only 40 of the 50 have a sufficient data history to calculate a reliable Sharpe Ratio
[18] Ironically, AGP, Anglo Potash Ltd, the group member with the highest recorded Sharpe Ratio, has transformed itself into an agricultural fertilizer company.

## 40 TSV Traded O&G Firms Listed By Sharpe Ratio

| Root Ticker | Company Name | 60 or 36 Month Annualized Volatlity | Sharpe Ratio |
|---|---|---|---|
| AGP | Anglo Potash Ltd. | 108.06% | 1.5917532 |
| CYR | Cirrus Energy Corporation | 51.00% | 1.2663665 |
| RYD | Ryland Oil Corporation | 262.29% | 1.0566484 |
| DEJ | Dejour Enterprises Ltd. | 95.89% | 1.0405573 |
| XE | Xemplar Energy Corp | 165.05% | 1.0095604 |
| AOI | Africa Oil Corp | 63.44% | 0.9848765 |
| TYK | Tanganiyika Oil Company | 62.66% | 0.9581314 |
| SLG | Sterling Resources Ltd. | 71.58% | 0.9277987 |
| NKW | Naikun Wind Energy Group Inc. | 124.83% | 0.8880687 |
| CLN | Culane Energy Corp | 62.28% | 0.8876330 |
| SOR | Solana Resources Ltd. | 125.68% | 0.8867627 |
| NRS | Norwood Resources Ltd. | 127.61% | 0.8698903 |
| FO | Falcon Oil and Gas Ltd. | 107.42% | 0.8431600 |
| OYL | CGX Energy Inc. | 98.74% | 0.8392235 |
| BUK | Bridge Resources Corp | 139.62% | 0.8303673 |
| STP | Southern Pacific Rescources Corp. | 381.49% | 0.8284908 |
| PEF | Petroflow Energy Ltd. | 156.62% | 0.8063599 |
| WSR | WSR Gold Inc. | 194.24% | 0.7717322 |
| ENG | Energulf Resources Inc. | 142.26% | 0.7601042 |
| PRD | Pacific Rodera Energy Inc. | 102.82% | 0.7033312 |
| GSA | Groundstar Resources Limited | 97.72% | 0.6748086 |
| TGE | TG World Energy Corp. | 198.87% | 0.6401807 |
| POE | Pan Orient Energy Corp | 274.76% | 0.6324145 |
| GBE | Grand Banks Energy Corp | 48.16% | 0.6322352 |
| SE | Stratic Energy Corporation | 68.08% | 0.6167447 |
| SQZ | Serica Energy PLC | 77.10% | 0.6135794 |
| WX | Wrangler West Energy Corp. | 27.15% | 0.6076697 |
| MMT | Mart Resources Inc. | 87.45% | 0.5990801 |
| LEY | Loon Energy Inc. | 78.24% | 0.5823124 |
| TTR | Terra Energy Corp | 221.33% | 0.5800585 |
| EUG | Eurogas Corporation | 76.72% | 0.5604726 |
| MCF | March Resources Corp. | 203.03% | 0.5247887 |
| GNO | Genoil Inc. | 92.88% | 0.5150072 |
| CNS | Canoro Resources Ltd. | 83.57% | 0.4793754 |
| CKK | Cordy Oilfield Services Inc. | 628.27% | 0.4678719 |
| TWO | Twoco Petroleums Ltd. | 44.96% | 0.4421068 |
| ORC | Orca Exploration Group | 74.60% | 0.4210496 |
| OEX | Orleans Energy Ltd. | 51.05% | 0.3842952 |
| BFR | Buffalo Resources Corp | 76.71% | 0.3289575 |
| SCS | Second Wave Petroleum Ltd. | 104.19% | -0.0471919 |

36 Month Data listed in BLUE

Average 0.7251658

While it might be argued that the July 1, 2003 through June 30, 2008 period is not representative of the TSE Index long-term average, there is good cause to evaluate Junior O&G firms on a five-year life cycle. Within five years most Junior O&G firms fall subject to one of the following scenarios: they fail entirely; they evolve into larger energy companies; they are transformed either by merger or acquisition; they sell-off successful discoveries and restart the exploration process afresh (usually better capitalized). So it is appropriate to come to some kind of projection of what the next five years of the Market Index Sharpe Ratio may average to and then apply this benchmark to the junior firms under consideration.

Ultimately it is the consensus of the Market (and not some theoretical finance formula) that determines the value of any publicly-traded firm (and, ergo, by extension what the appropriate cost of equity is for that firm). It is the investor's confidence in a firm's ability to generate future cash earnings, under a wide array of economic conditions that determines the price the market places upon any firm. The more confident investors are that these cash flows can still be achieved regardless of the macroeconomic uncertainties these firms may endure, the less volatility the month-over-month stock prices will be. The effect of this confidence can be seen in the following table of the larger integrated O&G producers. While they have been subject to exactly the same commodity price uncertainties over the prior 60 months as the juniors, their Sharpe Ratios have exceeded or kept pace with the Market Index (with the one notable exception of Petro Canada).

**Larger Integrated Oil and Gas Firms trading on the TSE - 60 Months of Historical Sharpe Ratio Data**

| Root Ticker | Company Name | Max. # of data months as at June 30, 2008 | Annualized Yield* in that Period | Beta: 60 month w S&P/TSX Index | $R^2$: 60 month w S&P/TSX Index | Volatility: Monthly standard deviation % over 60 months | Annualized volatility | CAPM implied cost of levered equity, June 30/08 | Annualized Sharpe Ratio, 60 Months @ June 30, 2008 |
|---|---|---|---|---|---|---|---|---|---|
| COS | Canadian Oil Sands Trust | 60 | 55.55% | 1.3065 | 0.27240 | 7.61% | 26.36% | 11.55% | 1.6935 |
| HSE | Husky Energy Inc | 60 | 42.29% | 1.5406 | 0.43600 | 7.10% | 24.60% | 12.88% | 1.4176 |
| CNQ | Canadian Natural Resource | 60 | 50.94% | 2.2215 | 0.47690 | 9.78% | 33.88% | 16.76% | 1.2862 |
| HTE | Harvest Energy Trust | 57 | 40.49% | 1.2215 | 0.21180 | 8.76% | 30.35% | 11.06% | 1.1555 |
| SU | Suncor (TSE) | 60 | 36.42% | 2.0041 | 0.54010 | 8.29% | 28.72% | 15.52% | 1.0944 |
| NXY | Nexen | 60 | 35.78% | 1.8051 | 0.44600 | 8.22% | 28.47% | 14.39% | 1.0856 |
| PWT | Penn West Energy | 60 | 28.85% | 1.0206 | 0.22500 | 6.54% | 22.66% | 9.92% | 1.0634 |
| ECA | Encana Corp | 60 | 32.24% | 1.4469 | 0.32870 | 7.68% | 26.60% | 12.35% | 1.0461 |
| ERF | Enerplus Resources Fund | 60 | 25.99% | 1.0544 | 0.27500 | 6.11% | 21.17% | 10.11% | 1.0152 |
| IMO | Imperial Oil (TSE) | 60 | 30.04% | 1.5871 | 0.41210 | 7.52% | 26.05% | 13.15% | 0.9943 |
| TLM | Talisman Energy | 60 | 28.36% | 1.7256 | 0.51890 | 7.28% | 25.22% | 13.94% | 0.9639 |
| PCA | Petro Canada | 60 | 17.21% | 1.5138 | 0.38590 | 7.41% | 25.67% | 12.73% | **0.5857** |

(CAPM derived cost of equity assumes a June 30, 2008 risk-free rate of 4.10% and a MRP of 5.70%)

## CONCLUSIONS

The Sharpe Ratio conveniently captures the historic price of risk as represented by the MRP per unit of volatility. For the Market as a whole, a broadly-based stock index, such as the TSE Index (i.e. S&P/TSX Composite Index, formerly known as the TSE300) can represent how much the market at large is willing to reward the investor for each unit of risk incurred. This standardized unit becomes an important benchmark in setting the minimum rate of return any investor should be willing to accept from any individual equity investment. This is because it is always possible for the investor to forego the specific non-diversifiable risks of investing in any individual firm and instead earn the market rate of return of a highly-diversified index.

The Canadian Oil and Gas Junior E&P firms have endured tremendous stock price volatility over the past 5 years and, of the group observed, most have failed to generate a unit-of-risk-return equal with the TSE Index. Such a finding may seem counter-intuitive considering the seemingly very high investment yields earned by this group over that time (the simple average for all 50 firms observed was an annualized positive yield of 47.2%). It must be remembered, however, that these seemingly high returns may vanish very quickly in the face of an average annualized volatility of 141%.

These observations have significant impact upon the expected cost of equity capital for these firms *if the same degree of volatility is expected in the future as has been incurred in the past.* By borrowing to invest in the Market Index, it is possible to simulate a portfolio of short Risk-Free and long Market Index that duplicates the risk exposure of any one of the O&G Juniors observed. And this, in turn, provides a means of calculating what the minimum rate of return an equity investor would expect on such a highly-volatile investment. For the sample firm considered, a return in excess of 100% (e.g. a Price-to-Earnings Ratio of 1:1) was determined and would not be an uncommon finding for any of the remaining firms in the group.

[a] In accordance with another Accession paper, the third in a three-part series, a grouping of 15 of these firms with 60 months of historic data were randomly selected from the group and a consolidated average of the month-over-month changes were regressed against the TSE Index. The theory is that non-systematic price distortions will be greatly mitigated as more firms are averaged into the group. Even so, the results of this grouping process were inconclusive. The resultant R-Squared only increased to 0.216 which is quite low considering the number of constituents. The regressed Beta was 3.0 and the annualized volatility of the consolidated group was 67.79%.

## APPENDIX A

### BORROWING AND VOLATILITY

In the preceding paper the idea was advanced that one could engineer any degree of volatility desired by simply by borrowing on a risk-free asset and investing in a risky asset. This concept is a basic tenet of portfolio theory, but perhaps is not really that intuitive.

After all, if one has $100 to invest in a risky asset with an annual standard deviation of 10.535%, then the volatility of that investment is said to be 10.535%. Similarly, if another, wealthier, investor has $1,019.65 to invest in this same risky asset; his volatility will also be 10.535% per year. The proportion of risk exposure remains the same regardless of initial principal invested.

Why then, would someone investing $1,019.65, being $100 of personal capital and $919.65 of borrowed capital incur a much higher exposure to risk? The reason is that borrowing magnifies (levers) the investor's exposure to gains and losses relative to his original personal capital.

Assume, for example, that the expected earnings probability distribution for the risky asset is normally distributed[1]. Then, the Empirical Rule would suggest there is an approximate 68% chance that, after one year, the return on this investment will be plus or minus 10.535% (i.e. one standard deviation). That also infers there is a 34% chance that, after one year; the original investment will be worth 89.465% of the original principal invested (i.e. down 10.535%). So, for the wealthy investor, investing his own $1,019.65, at year-end his holdings would be worth $912.23 and his unrealized losses amount to the 10.535% decline. For the levered investor, his holdings in the risky asset would also be worth $912.23, a decline of $107.42 ($912.23 - $1,019.65). This $107.42 unrealized loss relative to his original $100 personal capital represents a 107.42% standard deviation. If

[1] Hopefully it is the case that these earnings are lognormally distributed, rather than normally distributed. This is a refinement, however, that has no material impact on the example that is being given.

the lending agency called his loan at that point in time, the decrease of one standard deviation on his holdings in the risky asset would represent a 107.42% decline in his personal capital as he would not only have lost his initial $100, but would have to further make good on the $7.42 ($912.23 – $919.65) lost principal on the borrowed funds.

In this manner, we can see that, by combining the ratio of investing personal capital and a calculated amount of borrowed risk-free funds, it is possible to simulate any level of volatility risk desired (always assuming, of course, that a willing lender can be found).