RESEARCH REPORT

THE REAL VALUE OF GOLD IN THE GROUND

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INTRODUCTION

This is the second in a series of articles and videos in collaboration with Mickey Fulp from Mercenary Geologist, analyzing the various segments within the gold mining and metals sector.

The first article was posted on January 30, 2015 and titled **The Real Cost of Mining Gold**. As the title suggests, the article examined the operations of 7 major gold mining companies to determine the real cost of mining gold since reporting standards have failed to provide an accurate picture to investors. Three short videos on the subject can be accessed here: **Cipher Research Media**.

This article focuses on advanced gold exploration & development companies. We examine a 24-year history of mergers and acquisitions to determine **the real value of gold in the ground** and to incorporate that value into our project and company valuation models.

Many portfolio managers, analysts and newsletter writers promote the idea that management is the most important criterion in valuing an exploration and development company. However, can you recall a company being taken over for its management team? While management is an important factor in finding and developing an asset in the most efficient manner, ultimately the project is what delivers the real value.

PROJECT IS KING

The value of a mineral asset is derived solely from the prospect of ultimately extracting the mineral for a profit. In order to perform a fundamental valuation of mining companies the amount of mineral resources and ultimately reserves must be estimated.

Typically an exploration and development ("E&D) company sets out to make a discovery, drill off the discovery into a resources, engineer the resource to determine the amount that can be economically extracted (reserve) and then either raise money to build a mine or sell the asset to an existing mining company.

In the most basic terms, the value of a gold mineral project is equal to the number of ounces in the ground that will be potentially extracted times the value or price of an ounce in the ground.

Value = Quantity x Price

VALUE OF AN OUNCE OF GOLD IN THE GROUND

In its purest form an ounce of gold in your hand is currently worth around $1,200 per ounce and gold in rock at concentrations or amounts not economic to mine gold is worth nothing. It therefore follows that "gold in the ground" is worth somewhere between $0 dollars and the current spot price; the key is to find out exactly how much or at least significantly narrowing that range.

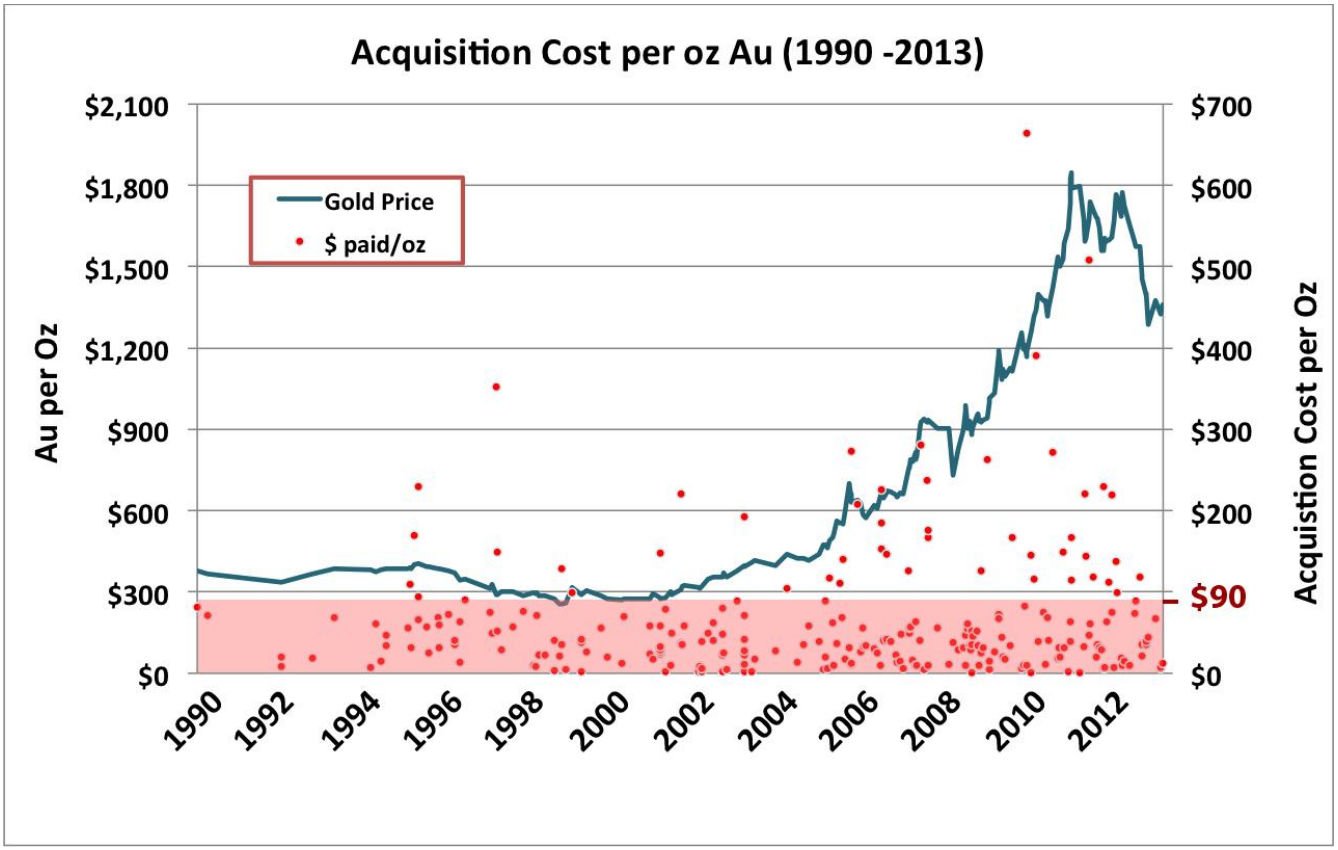
We use Comparable Transactions Method to benchmark the value of an ounce of gold in the ground.

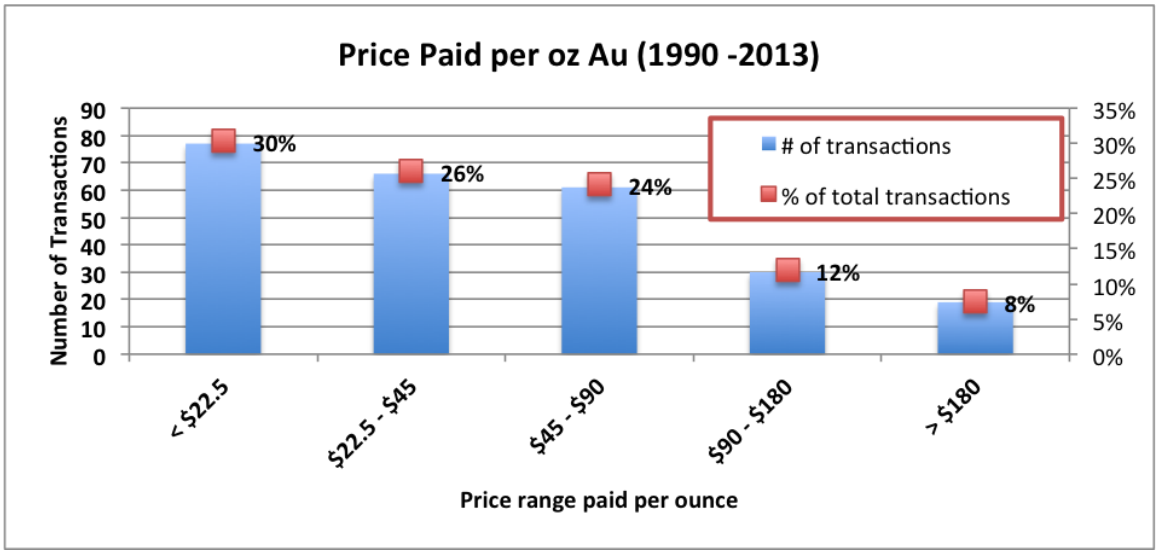
Comparable transaction method relies on the principle of substitution; the mineral property being valued is compared with the transaction value of similar mineral properties, transacted on an open market

It is important to note here that while take-over is not the only option for advanced explorers & developers, it is the only one that can accurately be measured and therefore provide a reliable market value benchmark of an ounce of gold in the ground.

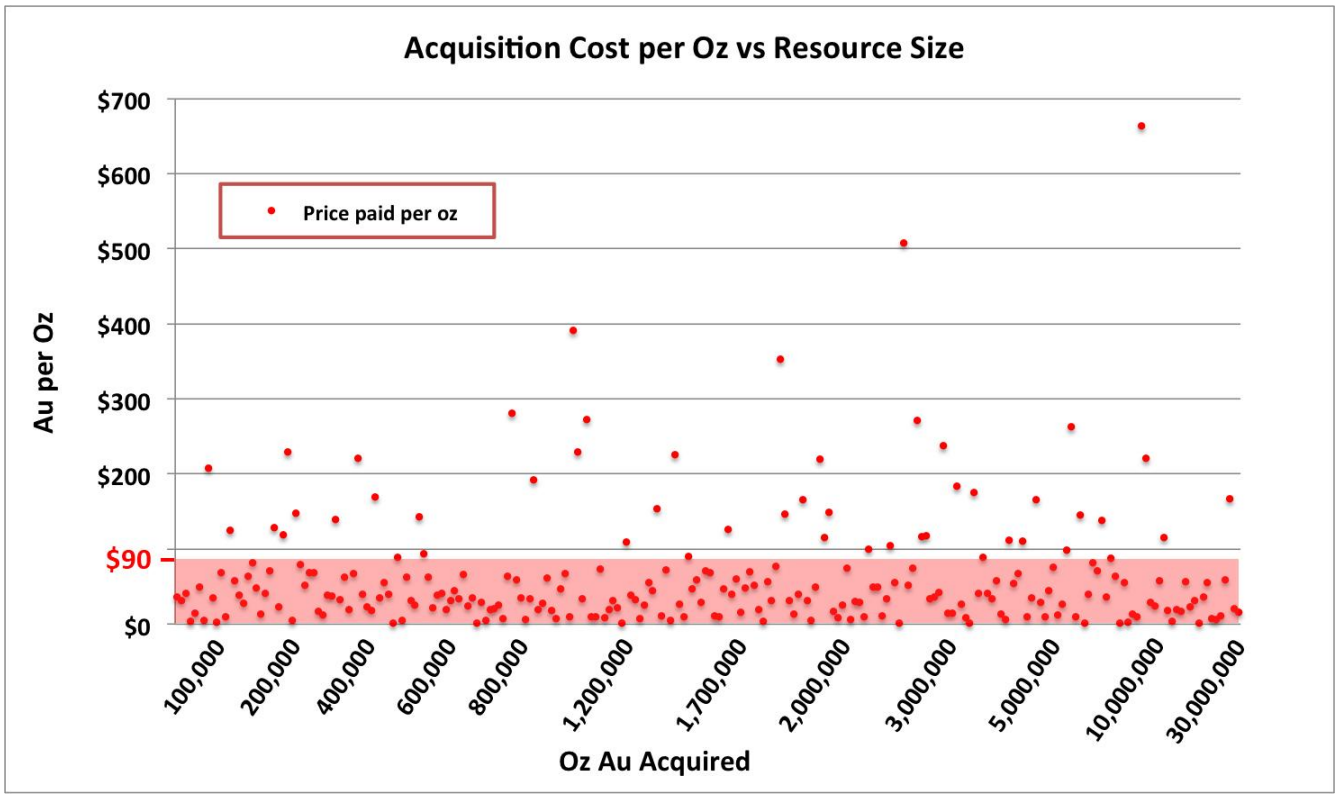
We examined 253 transactions involving gold projects or companies owning a gold project, which were acquired in the period 1990-2013.

The range and distribution of values are shown in the charts and tables below:





Price Paid vs Stage and Jurisdiction								
	All deals	Feasibility – Reserve Development	Preproduction – Production	Africa	Asia	Europe	Latin America	Canada/US
Price paid per oz Au Reserve & Resource								
Average	$63	$52	$69	$64	$65	$43	$81	$49
Median	$39	$34	$40	$34	$47	$39	$41	$31



The conclusions that can be drawn from the statistical analysis illustrated in the charts and tables include:

- 80% of all transaction occur at $90/oz or less
  - over half (56%) occurred below $45/oz
- With the exception of a few outliers, there is little or no correlation to the price of gold

- The average price paid for gold in the ground was $63/oz
- The median price was $39/oz
- Slightly higher premiums were paid for projects in development or production versus resource definition stage
    - Average price is 33% higher ($52 vs $69/oz)
    - Median is 18% higher ($34 vs $40/oz)
- There is surprisingly little difference in prices based on geographical location. (Although not measured we believe that this is a result of the cumulative effect of all risk premium attached – for instance high political risk in some jurisdictions may be offset by low permitting risk)
- The size of the resource was not positively correlated to the price paid (In other words miners pay for the quality of the project not the quantity of oz)

Having established the range of values of an ounce of gold in the ground, we turn our attention to the second variable: the number of ounces in the ground.

SIZE OF RECOVERABLE RESERVE/RESOURCE

Determining the size of the Recoverable Reserves/Resource is a two dimensional task; on one hand we want to count only the ounces which will be produced and sold at a profit and at the same time determine where they fall on the range of value.

The higher the level of confidence that the ounces in the ground will be economically extracted and processed into a finished gold bar, and the higher the projected profit margins from the ultimate sale of these gold bars, the higher the value of these ounces in the ground.

There are three types of engineering studies, listed in order of increasing level of confidence: Preliminary Economic Assessment; Pre-Feasibility Study; and Feasibility Study. Each report determines the overall grade and tonnage of the mineral resource and for the latter two, the amount of reserves that can be economically mined, processed, and recovered.

All studies are independent and strictly regulated, however they always require informed assumptions and estimates of many technical and economic variables. Slight changes in one or any of these variables can drastically change the projected overall economics. Investors should keep in mind that there is a strong incentive for companies to persuade engineering firms to use more favorable assumptions in the economic calculations.

Below are some of the key, and subject to, assumptions variables in determining the economic viability of extracting a mineral deposit:

Projected selling price of the metal
The assumed selling price of the gold determines both the expected revenues as well as the cut-off grade used in calculating the resource size. Higher metal prices allow for lower cut-off grades - as prices rise, the grades required to "make a mine" fall. A small change in the assumed price can make the difference between a deposit being deemed economic and non-economic.

Cut-off grade
The cut-off grade in basic terms is the break-even grade to mine and process; the grade above which the company makes money, below which would result in a loss. Minor changes in cut-off grade can cause huge changes in the size of resources and reserves.

Capital Expenditure (CAPEX)
CAPEX are the costs to build a mine, increase production, or upgrade facilities. CAPEX is accounted for by spreading it out over the life of the mine as a depreciated expense. Most of these expenditures occur prior to the commencement of mining.

Sustaining Capital
Sustaining capital costs are expenditures to maintain levels of production. Initial construction of a mineshaft or stripping of an open-pit are examples of CAPEX while deepening a shaft or laying back a pit are examples of sustaining costs. Companies and engineering firms may move costs from CAPEX into sustaining capital in order to shorten the initial payback period and make the economics of a deposit appear better.

Operation Costs (OPEX)
The operating expenses (OPEX) include all the direct costs of producing an ounce of gold. They are estimated from peer costs at similar mines operating in similar jurisdictions. Since there are no two deposits that are identical and costs vary significantly across countries and periods, spurious comparisons could be made resulting in skewed project economics.

Mineable Potion
Not all ounces categorized as reserve or resource will ultimately be mined. The minable portion is that amount which will be extracted at a profit. Understanding the geometry of the deposit for instance is crucial as material that is too far outside or below a potential open pit or too far away from, or below a potential shaft may never become economic and has no actual value.

In our valuation methodology we examine all the assumptions and key variables used in technical reports and when necessary make adjustments to the resource model and the financial analysis. The following case studies show the significance of this process.

Case Study 1 (Company A)
This company (Company A) published a global resource of 5,998,000 oz at its cut-off grade of 0.20 g/t and gold price assumption of $1400/oz. The company went on to complete a Preliminary Economic Assessment and most recently a Pre-Feasibility Study on the project with the same assumptions and showed an after-tax NPV (5%) of $509 million in the PEA (5%) and $409 million in the Pre-Feasibility, indicating substantial upside for investors. When we look at the resource more closely however, we find issues, which warrant adjustments that dramatically affect the economics.

The price of gold used for the calculations was $1400 per ounce, which from today's point of view is too high. The assumed price firstly overstates the projected revenues and secondly allows for a lower cut-off grade to be used as the break even. The resulting cut off grade of 0.20 g/t is not realistic given the location and type of deposit.

CASE STUDY 1 - RESOURCES									
	Measured & Indicated			Inferred			TOTAL GOLD		
Cut-off (g/t)	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz
0.1	269.2	0.40	3.5	271.6	0.33	2.9	540.8	0.37	6.4
0.2	247.9	0.42	3.3	226.3	0.36	2.6	474.2	0.39	5.9
0.3	163.8	0.51	2.7	120.7	0.47	1.8	284.5	0.49	4.5
0.4	95.7	0.62	1.9	57.8	0.60	1.1	153.5	0.61	3.0
0.5	57.9	0.73	1.4	32.3	0.73	0.8	90.2	0.73	2.1
0.6	36.2	0.85	1.0	19.7	0.84	0.5	55.9	0.85	1.5
0.7	23.2	0.96	0.7	12.8	0.95	0.4	36.0	0.96	1.1
0.8	15.1	1.09	0.5	8.1	1.06	0.3	23.2	1.08	0.8

As the table shows when we use a more realistic 0.50 g/t as the cut-off ($19.3/tonne @ $1200/oz) we see:

- Total tonnes decrease by 81% from 474 to 90 million tonnes
- Grade increase by 86% and is still significantly less than 2 times the cut-off grade

- Total gold decreases by 65% from 5.9 to 2,1 million ounces

The balance of 384 million tonnes grades 0.314 g/t or 3.9 Mi oz is below the new cut-off and would be considered waste with no value. This adjustment alone has a very significant impact on the potential Resource Value.

The second table shows the pit-constrained resource that could ultimately be mined as defined by the PEA study:

- Total tonnes decrease by 64% from 474 to 261 million tonnes
- Total gold decreases by 57% from 5.9 to 3.4 million ounces

Case Study 1 - Pit-Constrained Resources									
	Measured & Indicated			Inferred			TOTAL GOLD		
	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz
Global Resource	247.9	0.42	3.3	226.3	0.36	2.6	474.2	0.39	5.9
Mineable Resource	185.8	0.41	2.4	75.4	0.39	0.9	261.2	0.40	3.4
Change	**-25%**	**-2%**	**-26%**	**-67%**	**8%**	**-64%**	**-45%**	**4%**	**-43%**

In summary, less than 60% of the total gold resource appears mineable and only 35% of the original resource remains when the cut-off grade is adjusted. These are very significant impacts on both the quantity and quality of ounces in the ground.

Although the company published an NPV of $409 million, after our adjustments the NPV becomes $0.

Case Study 2 (Company B)

The second case study is of a company that was spawned from a shell in 2005 and was acquired by a mid-tier gold miner in 2013 for $370 million. Net of cash acquired, the miner paid $300 million for the junior's gold project.

The company completed and published several resource estimates during its history, culminating in a base case global mineral inventory of measured, indicated, and inferred resources totaling 10.7 million ounces of gold at a 0.35 g/t Au cut-off grade. The gold price used for the estimate was $1400/oz, which is too high for an economic evaluation today. Nonetheless, here is the published resource at various cut-off grades:

CASE STUDY 2 - RESOURCES									
	Measured & Indicated			Inferred			TOTAL GOLD		
Cut-off (g/t)	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz
0.1	523.9	0.54	9.2	1,228.3	0.23	9.1	1,752.2	0.32	18.2
0.2	361.7	0.72	8.4	390.4	0.44	5.5	752.1	0.57	13.9
0.3	251.2	0.93	7.5	202.9	0.62	4.0	454.1	0.79	11.6
0.35	213.7	1.03	7.1	162.2	0.69	3.6	375.9	0.88	10.7
0.4	184.4	1.14	6.8	125.1	0.78	3.1	309.5	1.00	9.9
0.5	141.9	1.35	6.1	81.2	0.97	2.5	223.1	1.21	8.7
0.6	112.8	1.55	5.6	55.3	1.17	2.1	168.1	1.42	7.7
0.7	91.9	1.76	5.2	36.7	1.43	1.7	128.6	1.66	6.9
0.8	76.5	1.96	4.8	28.1	1.64	1.5	104.6	1.87	6.3

Comparing the resource at 0.35 g/t to the one at 0.50 g/t we see:

- Total tonnes decrease from 376 to 223 million tonnes or 41%.
- Grade increases from 0.88 g/t Au to 1.21 g/t Au but is still well-above two times the cut-off grade.
- Total gold decreases 19% from 10.7 to 8.7 million ounces

The company completed two Preliminary Economic Assessments on this resource. Using the 0.35 g/t Au cut-off and a gold price of $1250/oz, the last one generated an after-tax NPV at 5% discount of $452 million.

This next table shows the pit-constrained resource that could ultimately be mined as defined by the PEA study:

Case Study 2 - Pit-Constrained Resources									
	Measured & Indicated			Inferred			TOTAL GOLD		
	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz
Global Resource	213.7	1.03	7.1	162.2	0.69	3.6	375.9	0.88	10.7
Mineable Resource	150.6	1.17	5.7	88.3	0.78	2.2	238.9	1.03	7.9
Change	**-30%**	**13%**	**-20%**	**-46%**	**13%**	**-38%**	**-36%**	**16%**	**-26%**

As it shows:

- Total tonnes decrease by 36% from 376 to 239 million tonnes
- Total gold decreases by 26% from 10.7 to 7.9 million ounces

Shortly before, the company published a Feasibility Study on the project using $1400/oz and 0.35g/t cut-off grade, which showed pre-tax and after-tax NPV's (5%) of $1,296 and $931 million respectively. This study also provided a sensitivity analysis using $1250/oz which produced a pre-tax and after-tax NPV's of $1002 and $721 respectively.

The following table shows the Proven and Probable reserves. As documented previously, feasibility-level studies do not include Inferred resources because they cannot be valued economically. Therefore, only the Measured and Indicated resources can be converted into reserves:

Case Study 2 – Resources & Mineable Reserves									
	Measured			Indicated			Measured & Indicated		
	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz	Million Tonnes	Au (g/t)	Au M oz
Global Resource	23.7	1.29	1.0	190.0	1.00	6.1	213.7	1.03	7.1
	Proven			Probable			Proven & Probable		
Mineable Reserve	27.7	1.14	1.0	88.6	1.06	3.0	116.3	1.08	4.0
Change	**17%**	**-12%**	**0%**	**-53%**	**6%**	**-51%**	**-46%**	**5%**	**-43%**

As it shows:

- Total tonnes decrease by 46% from 214 to 116 million tonnes
- Total gold decreases by 43% from 7.1 to 4.0 million ounces

The following table shows the actual takeover price, the size of the various resources published by the company, and the calculated value per ounce for each:

Takeover Price: $300,000, 000	**Size**	**Takeover Price ($/oz)**
Global Resources	10.7 M oz	$28
PEA Mineable Resources (base-case)	7.9 M oz	$38
Feasibility Reserves (base case)	4.0 M oz	$75

Since engineering studies calculate Net Present Values for a project, we can evaluate the sensitivity to factors such as gold price, discount rate, operating costs, and other key variables.

This table compares the actual takeover price with values calculated from the various published studies:

	Value
Takeover Price - net of cash	$300 million
Global Resource - 10.7 M oz x $40/oz (median in-situ value)	$428 million
PEA Study base-case - $1250 Au at 5% discount rate (Pre-tax/After-tax)	$846/$608 million
PEA Study sensitivity case - $1250 Au at 10% discount rate (Pre-tax/After-tax)	$452/$325 million
Feasibility Study base case - $1400 Au at 5% discount rate (Pre-tax/After-tax)	$1296/$931 million
Feasibility Study sensitivity case - $1250 Au at 10% discount rate (Pre-tax/After-tax)	$535/$385 million
Cipher's adjusted value from Feasibility Study	$370 million

We present both pre-tax and after-tax NPV numbers as

The key points are:

- Only 4 million ounces of the original 10.7 million ounces made it to the Proven and Probable category, a decrease of 63%.
- The global resource is mildly sensitive to changes in cut-off grade with the total gold resource decreases by 19% between 0.35 g/t and 0.5 g/t cut-off grades, indicating a robust deposit (the less sensitive a resource is to changes in cut-off grade the higher the quality of the resource). The overall grades are significantly more than two times the various cut-offs, indicating a robust deposit.
- The global resource was valued at $28 an ounce in the takeover, well-below the median benchmark price of $40 for gold in the ground for 253 takeovers.
- The base-case for the PEA was over twice the actual takeover price.
- The base-case for the Feasibility Study was well over three times the actual takeover. Note that the base case supposedly has the highest level of confidence in an engineering study.
- The sensitivity case for the PEA using $1250 and a 10% discount is closest to the actual take-over. However, that study used 7.9 million ounces, nearly double the eventual reserves.
- The sensitivity for the Feasibility using $1250 and 10% is a reasonable approximation but is still 35% above the takeover price
- Cipher's adjusted value of $370 million is still too high but is better than the company's engineering study in matching the eventual takeover price.

The discrepancies between the actual takeover price and published engineering values illustrate the necessity of careful due diligence. Unrealistic assumptions and key variables are commonly used by consulting engineering firms when calculating future project cash flows.

So far we have demonstrated how we derive the Value of project following the equation
Value = Quantity x Price with adjustments when and where necessary. The next step is to compare the Value of the project to the company's share price and market valuation - the result is Cipher's time value model.

CIPHER'S TIME VALUE MODEL

To demonstrate our time value modeling we will use the company from Case study B:

The junior company was a shell that acquired a project with mineralized drill intercepts and a well-defined target area and did a 4:1 stock split at the end of Q3 2004, then completed a reverse takeover with 14.0 million shares outstanding. The stock began trading in 2005 with a private placement at 25 cents that raised $3.4 million and positioned insiders, friends, and family. This was soon followed by another small raise for $2.0 million at 63 cents that again placed those closely connected with the company.

The company delivered encouraging drill results in 2006 and completed a large brokerage raise at $1.17 for $14.5 million. At that point, it had 43.3 million shares outstanding and had risen $20.0 million via the public markets for an average price of 46 cents.

Subsequently, the company raised $300 million by issuing a total of 56.7 million shares at an average price of $5.31 for $300 million.

These financings included a $75 million bought deal at $12.80 during the top of the gold market in late 2011. It was led by two of Canada's largest brokerage firms.

Here is a history of the share capital and moneys raised as detailed in year-end fiscal statements:

Date	Share O/S	Share Capital	Shares Issued	Ave Price	$ Raised
30-Sep-04	3,251,619	$4,743,033	3,251,619	$0.00	$0
30-Sep-04	13,981,466	$4,743,033	10,729,847	$0.00	$0
30-Sep-05	27,673,378	$8,179,403	13,691,912	$0.25	$3,436,370
31-Dec-05	30,815,253	$10,154,798	3,141,875	$0.63	$1,975,395
30-Sep-06	43,261,828	$24,703,421	12,446,575	$1.17	$14,548,623
30-Sep-07	54,740,238	$61,772,099	11,478,410	$3.23	$37,068,678
31-Dec-09	57,161,890	$70,354,790	2,421,652	$3.54	$8,582,691
31-Dec-10	75,219,349	$143,960,232	18,057,459	$4.08	$73,605,442
31-Dec-11	84,016,582	$235,034,032	8,797,233	$10.35	$91,073,800
31-Dec-12	99,904,050	$325,566,869	15,887,468	$5.70	$90,532,837
31-May-13	99,973,216	$325,828,861	69,166	$3.79	$261,992

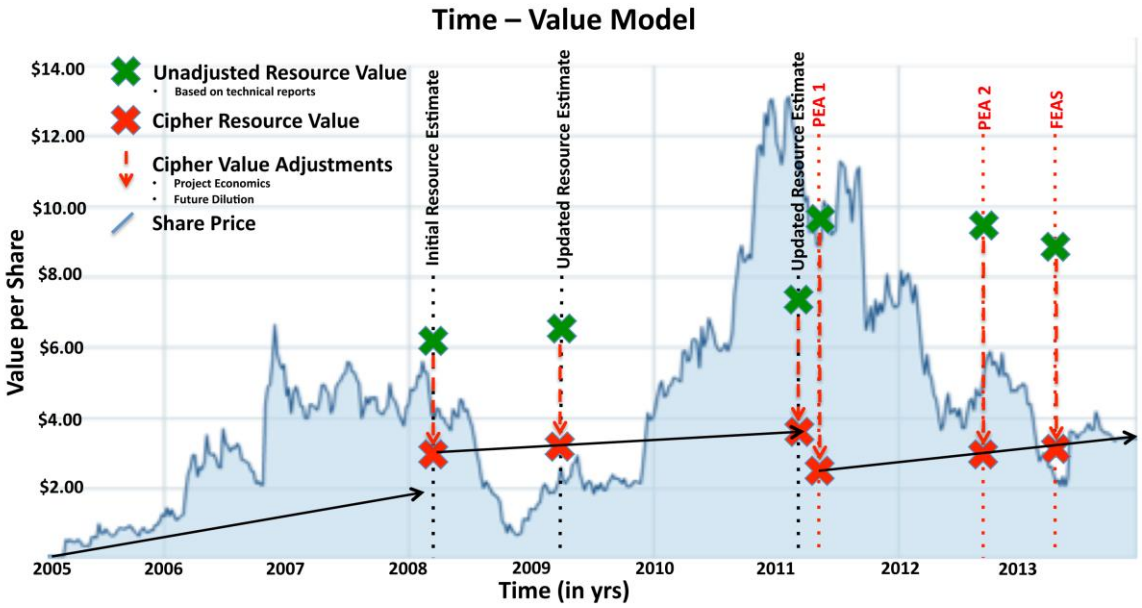
The gold deposit was ultimately acquired by a mid-tier mining company for a total value of $370 million, or $300 million net of the $70 million cash on hand. The junior had raised $320 million during its eight-year lifespan for a total return of 13.5%. It spent $250 million to acquire, explore, and engineer the project and sell-out to a miner.

In analyzing its history, the founders and other early investors acquired 43% of the company at an average price of $0.46 per share. If they had held onto all of their shares until the takeover occurred, the return would have been over 700% on their investment over a seven-year period.

Investment bankers and brokers would have collected fees in cash and/or broker warrants on the public offerings of over $300 million and on the $375 million take-over.

The investors who bought in for a total of $300 million or 94% of the total money raised and acquired 57% of the shares at an average price of $5.31 did not fare well at all. They lost on average over 30% of their investment, never mind the poor souls who were part of that $12.80 private placement on a gold deposit whose real resource value was never worth more than its acquisition price of $3.70 per share.

Let's explore that idea in more detail using Cipher Research's time-value modeling in the chart below:



- The **blue** line is the actual share price of the target company

- The first three **green X**s are the resource values for three published resource estimates divided by the number of shares outstanding at the time. The resource values here are derived by number of ounces in the global resource **as reported by the companies** times $90

- The second three **green X**s are the unadjusted resource values for three engineered resources studies (two PEAs and the Pre-Feasibility divided by the number of shares outstanding at the time. The values of the engineered resource studies are equal to the NPV **as reported by the companies**

- The **red X**s represent Cipher Research's per share valuation after the necessary adjustments were made for project stage, various economic factors, and the future dilution required in financing the company to its next milestone. The Cipher Resource Value represents the upper limits of what we deem the company's intrinsic value. The company would be considered a "buy" when below this level, "cautious hold" when slightly above this level and a "sell" when significantly above.

Note that the unadjusted resource values (**green X**s) represent the value of the project as it would commonly be perceived by the market. Most investors assume that the resource estimates and/or NPVs published by an independent engineering firm are an accurate representation of a project's value.
This is generally not the case. In fact, consulting engineering firms operate in a highly competitive business environment and are hired by clients with the expectation that they will tailor technical reports to the client's needs and desires.

Have you ever come across a *negative* feasibility study? Remember for every failed mine, there was a *positive* feasibility study.

For this reason, investors must scrutinize engineering reports carefully and often make adjustments to assumptions and key variables to get a more accurate value for the project at any particular point in time
This company was one of the many companies evaluated by Cipher Research and represents a good case study of a quality asset, which was worth buying into but rarely in its history did it offer value investors a real chance to make money.

As already mentioned, the company was sold for $3.70 per share, valuing ounces in the ground well below the Unadjusted Resource Value promoted to the market but within the Ciphers Range of Value. Moreover the modeling shows that for almost its entire history the company was trading above its intrinsic value.

This company is unfortunately not a unique case. Management and other early investors, brokers and finders are the groups that were able to ensure profits from their involvement in the company and naturally took advantage of irrationally exuberant markets. Investors also had opportunity to make money if they were wise enough to buy and sell at the right time. Of course there was always someone on the other end of these transactions, meaning that most investors would have lost money.

In conclusion, our advice to investors is to scrutinize any information presented to them by or on behalf of an exploration and development company. If third party advice is required, ensure that it is unbiased and competent.

For further insight, we kindly suggest you view our three short videos on this subject. They are syndicated exclusively to **GoldSeek.com**, and are also available on our website, **CipherResearch.com**, and Mickey's website **MercenaryGeologist.com**.

For more insights and information on this and various other topics related to the metals and mining markets, please contact **info@cipherresearch.com**

About Cipher Research

Cipher Research Ltd. is an independent research and analysis company covering Metals and Mining markets. We develop comprehensive valuation models applying the disciplines of Geology, Economics, Statistics and Finance ("Geonomics"). Our valuation models have proven to be successful in generating investing and trading strategies.
