

# Discount Rate Extraction from Transaction Analysis for Income Approach Valuation of Mineral Properties

**Trevor R. Ellis, CPG, CMA, CGA, FAusIMM**

**2001-2008 Chairman, Extractive Industries Task Force**

**International Valuation Standards Committee**

**Mineral Property Appraiser  
Ellis International Services, Inc.  
Denver, Colorado, USA  
[www.minevaluation.com](http://www.minevaluation.com)**



SME-AIMA Annual Meetings, Seattle, 19 – 22 February 2012

# Previous Income Approach Paper of Ellis

Ellis, 2005, “Violations of Market Value Standards with the Income Approach,” presented in Valuation Session, SME-AIMA 2005 Annual Meeting, Salt Lake City.

Subtitled: ***Don't Get Caught Doing This!***

The slide presentation is available at *minevaluation.com* in the publications page, 2005 section.

# Context

- Mining industry valuations are commonly based on Net Present Value (NPV) of Cash Flows
  - NPV/DCF method of the Income Approach.
- Most mining industry appraisals only provide an economic evaluation NPV, or an estimate of Investment Value
  - Based on a specific entity's (company's) investment parameters.
  - Is NOT an estimate of Market Value based on inputs derived from markets for mining industry assets.

# Common Discount Rate Estimation

- Capital Asset Pricing Model (CAPM)
- Weighted Average Cost of Capital (WACC)
- Rate Build-up Method
  - from a safe rate.

# Valid Market Value Estimation by the Income Approach

- The extractive industries standards (GN 14) of the *International Valuation Standards, 2005 and 2008 Ed.* state:
  - At 5.3.1: You can often extract useful parameters, such as discount rates from transactions. (paraphrased).
  - At 5.3.3: If developing a Market Value estimate you must consider extracting discount rates from transactions. (paraphrased from this and the standard GN 9 it references).

# Brookfield Quarry, Connecticut

## Transaction Analysis

Photo 1: Subject, July 2004 Valuation Date  
Brookfield, Connecticut  
Granitic gneiss and dolomite quarry

Photo 2: Transaction, May 2006  
New Milford, Connecticut  
Dolomite quarry  
Acquisition price \$37 million:  
\$32 million for real property  
\$5 million for P&E, contracts, and goodwill.







Year	Activity	Investment \$(000)	Production Tons/yr (000)	Revenue \$/ton	Operating Expense \$/ton	SG-&A 8% of Sales \$/ton	Return to Management 15% of Sales \$/ton	Constant 2006\$ Cashflow \$(000)	PV @ 7.4% \$(000)	Escalated \$ Cashflow \$(000)	PV @ 11.1% \$(000)
May-06	Acquisition and 7 mths operation	37,000	420	12.40	6.00	0.99	1.86	-35,510	-35,510	-35,510	-35,510
2007	Equipment upgrade	5,000	600	12.40	5.50	0.99	1.86	-2,571	-2,395	-2,661	-2,395
2008	Equipment upgrade	5,000	720	12.40	5.50	0.99	1.86	-2,085	-1,809	-2,234	-1,809
2009			900	12.40	5.25	0.99	1.86	3,868	3,126	4,289	3,126
2010			900	12.40	5.25	0.99	1.86	3,868	2,911	4,439	2,911
2011			900	12.40	5.25	0.99	1.86	3,868	2,712	4,594	2,712
2012	Additional trucks	900	900	12.40	5.25	0.99	1.86	2,968	1,938	3,649	1,938
2013			900	12.40	5.25	0.99	1.86	3,868	2,352	4,921	2,352
2014			900	12.40	5.25	0.99	1.86	3,868	2,191	5,094	2,191
2015			900	12.40	5.25	0.99	1.86	3,868	2,041	5,272	2,041
2016			900	12.40	5.25	0.99	1.86	3,868	1,901	5,456	1,901
2017			900	12.40	5.25	0.99	1.86	3,868	1,770	5,647	1,770
2018	Additional equipment	1,000	900	12.40	5.25	0.99	1.86	2,868	1,223	4,334	1,223
2019			900	12.40	5.25	0.99	1.86	3,868	1,536	6,050	1,536
2020			900	12.40	5.25	0.99	1.86	3,868	1,431	6,261	1,431
2021			900	12.40	5.25	0.99	1.86	3,868	1,332	6,481	1,332
2022			900	12.40	5.25	0.99	1.86	3,868	1,241	6,707	1,241
2023			900	12.40	5.25	0.99	1.86	3,868	1,156	6,942	1,156
2024			900	12.40	5.25	0.99	1.86	3,868	1,077	7,185	1,077
2025			900	12.40	5.25	0.99	1.86	3,868	1,003	7,437	1,003
2026			900	12.40	5.25	0.99	1.86	3,868	934	7,697	934
2027	Replace equipment	5,000	900	12.40	5.25	0.99	1.86	-1,132	-255	-2,331	-255
2028	Replace equipment	5,000	900	12.40	5.25	0.99	1.86	-1,132	-237	-2,412	-237
2029			900	12.40	5.25	0.99	1.86	3,868	755	8,534	755
2030			900	12.40	5.25	0.99	1.86	3,868	703	8,832	703
2031			900	12.40	5.25	0.99	1.86	3,868	655	9,142	655
2032			900	12.40	5.25	0.99	1.86	3,868	610	9,461	610
2033			900	12.40	5.25	0.99	1.86	3,868	568	9,793	568
2034			900	12.40	5.25	0.99	1.86	3,868	529	10,135	529
2035			900	12.40	5.25	0.99	1.86	3,868	493	10,490	493
2036	Sale of property	(30,000)	900	12.40	5.25	0.99	1.86	33,868	4,019	95,061	4,019

Constant dollar IRR =  
7.4% per annum

Escalated dollar IRR =  
11.1% per annum

Total PV=  
\$0

Total PV=  
\$0

# Las Brisas, Venezuela

## Transaction Analysis

Photo 3: Subject, February 2006 Valuation Date

Las Brisas, Km 88 district, Venezuela

Gold property with 10m oz P&P gold reserve

Awaiting environmental permit for mine development

Photos 4: Transaction, January 2006

Choco 10, Venezuela:

Operating open pit gold mine with 1.22m oz gold reserves

Acquisition of 95% interest for \$353 million

Gold price \$544.4/oz; 93% Au recovery

Cash operating cost including royalty \$185/oz production

Constant \$, before income tax cash flow analysis







**Table XX: Bolivar Gold Corps' Choco 10 Mine, Venezuela**  
**Internal Rate of Return Calculation for Gold Fields' Acquisition offer on 11th of January 2006**

Year	Activity	Investment \$(000)	Production oz/yr Au (000)	Revenue price \$/oz Au	Royalty Rate %	Operating Cost and Sustaining Capital \$/oz	CVG carried interest %	Operating Income \$/oz	Cashflow \$(000)	PV @ 12.1% \$(000)
Jan-06	Acquisition	353000	-	-	-	-	5	-	-353,000	-353,000
2006	Expansion capital	50000	190	500	8	199	5	257.45	-1,085	-987
2007			250	500	8	199	5	257.45	64,363	51,216
2008			250	500	8	199	5	257.45	64,363	45,687
2009			250	500	8	199	5	257.45	64,363	40,755
2010			250	500	8	199	5	257.45	64,363	36,355
2011			250	500	8	199	5	257.45	64,363	32,430
2012			250	500	8	199	5	257.45	64,363	28,929
2013			250	500	8	199	5	257.45	64,363	25,806
2014			250	500	8	199	5	257.45	64,363	23,020
2015			250	500	8	199	5	257.45	64,363	20,535
2016			250	500	8	199	5	257.45	64,363	18,318
2017			250	500	8	199	5	257.45	64,363	16,341
2018			250	500	8	199	5	257.45	64,363	14,576

Selling price of gold= **500 \$/oz**  
 Internal Rate of Return = **12.1% annum**

<b>Total PV</b>	<b>0</b>
-----------------	----------

Cash flow calculations in constant dollars, before income taxes, depreciation and depletion.

The operating cost shown is the sum of the cash operating cost of \$185/oz plus sustaining capital and closure costs of \$14/oz.

Total contained gold P&P + M&I&I, less 2005 mined = 3.43m oz Au.

Life of mine of 13 years assumes mining equivalent to all Reserves and Resources. Average recovery factor assumed of 93% resulting in 3.19m oz Au recoverable.

Gold Fields purchase \$353m plus 2006 expansion capital of \$50m = \$403m investment.

**Table XX: Bolivar Gold Corps' Choco 10 Mine Internal Rate of Return Calculation  
for Gold Fields' Acquisition offer on 11th of January 2006**

Year	Activity	Investment \$(000)	Production oz/yr Au (000)	Revenue price \$/oz Au	Royalty Rate %	Operating Cost and Sustaining Capital \$/oz	CVG carried interest %	Operating Income \$/oz	Cashflow \$(000)	PV @ 3.1% \$(000)
Jan-06	Acquisition	353000	-	-	6	-	5	-	-353,000	-353,000
2006	Expansion capital	50000	190	500	6	199	5	257.45	-1,085	-1,052
2007			263	500	6	199	5	257.45	67,709	63,656
2008			263	500	6	199	5	257.45	67,709	61,721
2009			263	500	6	199	5	257.45	67,709	59,845
2010			263	500	6	199	5	257.45	67,709	58,025
2011			263	500	6	199	5	257.45	67,709	56,262
2012			263	500	6	199	5	257.45	67,709	54,551

Selling price of gold= **500 \$/oz**  
Internal Rate of Return = **3.1% annum**

<b>Total PV</b>	<b>8</b>
-----------------	----------

Cash flow calculations in constant dollars, before income taxes, depreciation and depletion.

The operating cost shown is the sum of the cash operating cost of \$185/oz plus sustaining capital and closure costs of \$14/oz.

Total P&P + 1/2M&I + 1/4\*1oz gold at the end of 2005 = 1.899 m oz Au. Recovery factor assumes at 93% which is equal to 1.766 m oz Au.

Life of mine of 7 years assumes mining equivalent to all Reserves and Resources.

Gold Fields purchase \$353m plus 2006 expansion capital of \$50m = \$403m

# Choco 10 IRR's

## Scenario 1 Analysis: All P&P + M&I&I Mined

- 3.19m oz Au being recovered over 13 year mine life
- \$544.4/oz Au at agreement, IRR 15.2%/annum
- \$500/oz Au, IRR 12.1%/annum
- \$470/oz Au, IRR 10%/annum



# Choco 10 IRR's

## Scenario 2 Analysis: Reserve Equivalent 1.9m oz Au mined over 7¼ years

- Reserve Equivalent = P&P + ½M&I + ¼I
- \$544.4/oz Au at agreement, IRR 7.1%/annum
- \$500/oz Au, IRR 3.1%/annum
- \$580/oz Au, 10%/annum

# Choco 10 IRR's

## Scenario 3 Analysis: Only P&P Reserves of 1.223m oz Au mined over 5 years

- \$544.4/oz Au at agreement, IRR is negative (-5.7%/annum)
- \$729/oz Au, IRR 10%/annum
  - Being 34% above agreement date price

# Negative IRR's

- Commonly found in gold property acquisition analyses during times of strong acquisition activity
- Were plentiful in the early 1980s.
- Typically indicates that the acquisition was made based on perceived (*blue sky*) potential beyond that included in the cashflow analysis.

# Analysis Requirements

- Cash flow model for transacted property built on similar basis to that for Subject
  - Before or After Income tax
  - Sustaining capital included or not included
  - Overhead expense categories treated the same
  - Constant or escalated (nominal) dollar
  - Real growth or no growth in gold price
  - Mine life includes similar resources or prospective finds
- IRR may need adjustment for relative project risk, external risk factors, project size, project development or operating state

# Discount Rate Selection for Las Brisas

- IRRs derived from another four gold property transactions
- A representative of Choco 10 Buyer (Gold Fields) interviewed to understand motives and bases of Buyer's NPV analysis
- Other gold industry discount rates considered

# Conclusions

- IRRs derived from transactions of similar mineral properties are often the best indication of the appropriate Market Discount Rate for use in Market Value Appraisal of a Subject Mineral Property
- Cash flow analysis of Transactions must be conducted on the same bases as for the Subject Property

# Conclusions

- Adjustments of the IRR may be needed for risk, project scale, and other difference to the Subject Property
- You should be the only Appraiser that uses an IRR that you derive
  - Your cash flow model structures are unlikely to match those of another mineral appraiser