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UT Energy Symposium

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Case Overview

Project Location

Project History

- **Time line:**

  - ▸ 1985 – Retter started an exploration program in Fruktania

  - ▸ 1994 – Oil discovered by Retter

  - ▸ 1996 – Civil war in Fruktania, Retter to declare force majeure and evacuate all expatriate staff

  - ▸ 2010 – End of civil war but fragile government

Case objective

- **Data given:**

  - ▸ Expected exploration and production costs with time

  - ▸ Expected production of oil and gas with time

- **Objective**

  - ▸ What is the NPV of this project?

Valuation methods

Project valuation methodologies

Method 1 **Deterministic NPV model using expected values**	• Using most likely values for production volumes, oil prices and capital and operating expenses • Use a higher discount factor to take into account the impact of expropriation • It is simple to calculate but not very insightful

Method 2 **Monte Carlo Simulation on production and costs**	• Use distributions to capture the uncertainty in production volumes, oil prices and capital and operating expenses • Use a higher discount factor to take into account the impact of expropriation • Does not take into account the extreme cases of expropriation

Step 3 **Monte Carlo with Embed Force Majeure Risk**	• Use distributions to capture the uncertainty in production volumes, oil prices and capital and operating expenses • Include Force Majeure Risk: Probability of a pre-mature termination of project because of expropriation / political instability • Better model to capture the risk involved

Method 1: Deterministic NPV

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Forecast Assumptions

Use most likely values for

- Future oil production
- Future crude oil price
- Future operating expense
- Future capital expense

Valuation Model

	2011E	2012E	2013E	2014E	2015E
Total Production (MMBbls)	67	68	68	68	65
Crude Oil ($/Bbl)	$83.81	$85.07	$86.43	$87.89	$89.44
Gross Revenue	$5,598	$5,775	$5,868	$5,967	$5,778
Less: Royalty	(1,400)	(1,444)	(1,467)	(1,492)	(1,444)
Net Revenue	$4,199	$4,331	$4,401	$4,475	$4,333
Less: Operating Costs	(349)	(359)	(366)	(374)	(372)
Less: Depreciation	(1,703)	(1,788)	(1,838)	(1,880)	(1,826)
EBIT	$2,146	$2,185	$2,197	$2,221	$2,135
Less: Taxes	(966)	(983)	(989)	(1,000)	(961)
Un-levered Net Income	$1,180	$1,201	$1,208	$1,222	$1,175
Plus: Depreciation	1,703	1,788	1,838	1,880	1,826
Less: CAPEX	(400)	(800)	(720)	(640)	(480)
Change in NWC	-	-	-	-	-
Free Cash Flow	$1,303	$988	$1,118	$1,240	$1,346
Discount Factor	0.909	0.826	0.751	0.683	0.621

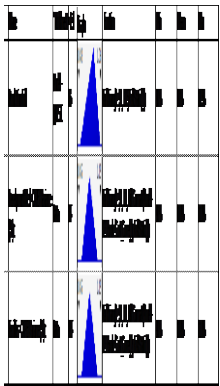| NPV	$33.8

Method 2: Monte Carlo simulation for NPV

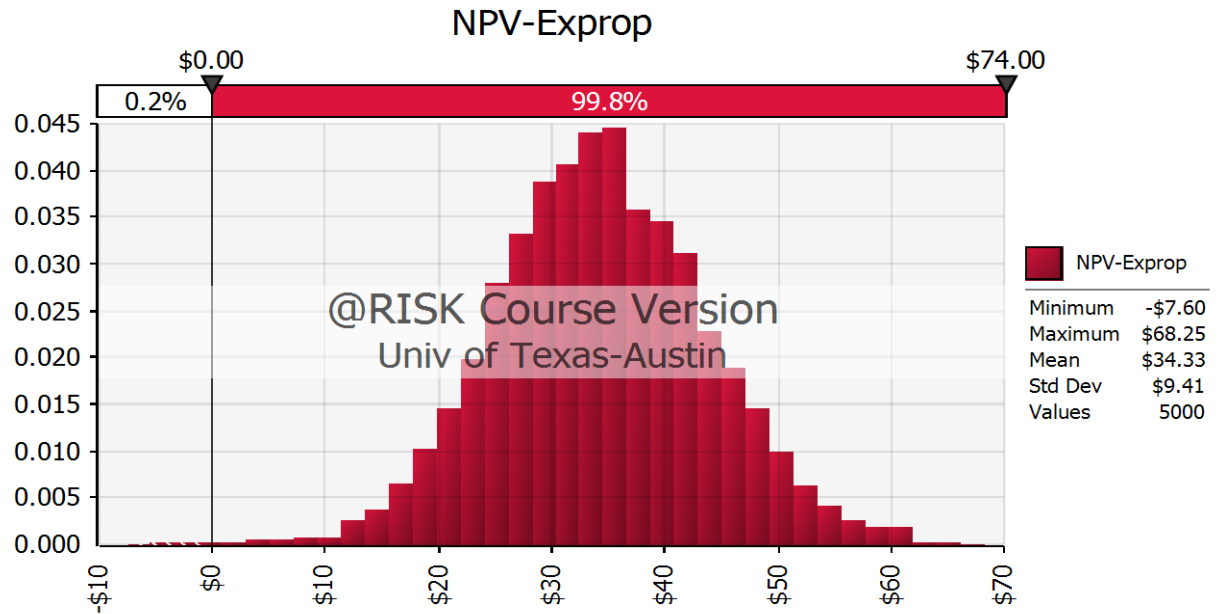## Forecast Assumptions

Use distribution values for

- Future oil production
- Future crude oil price
- Future operating expense
- Future capital expense

Run iterations and get NPV distribution instead of a single NPV value

Distributions for inputs

Output NPV distribution

NPV-Exprop

Minimum	-$7.60
Maximum	$68.25
Mean	$34.33
Std Dev	$9.41
Values	5000

Method 3: Monte Carlo simulation with Force Majeure risk for NPV
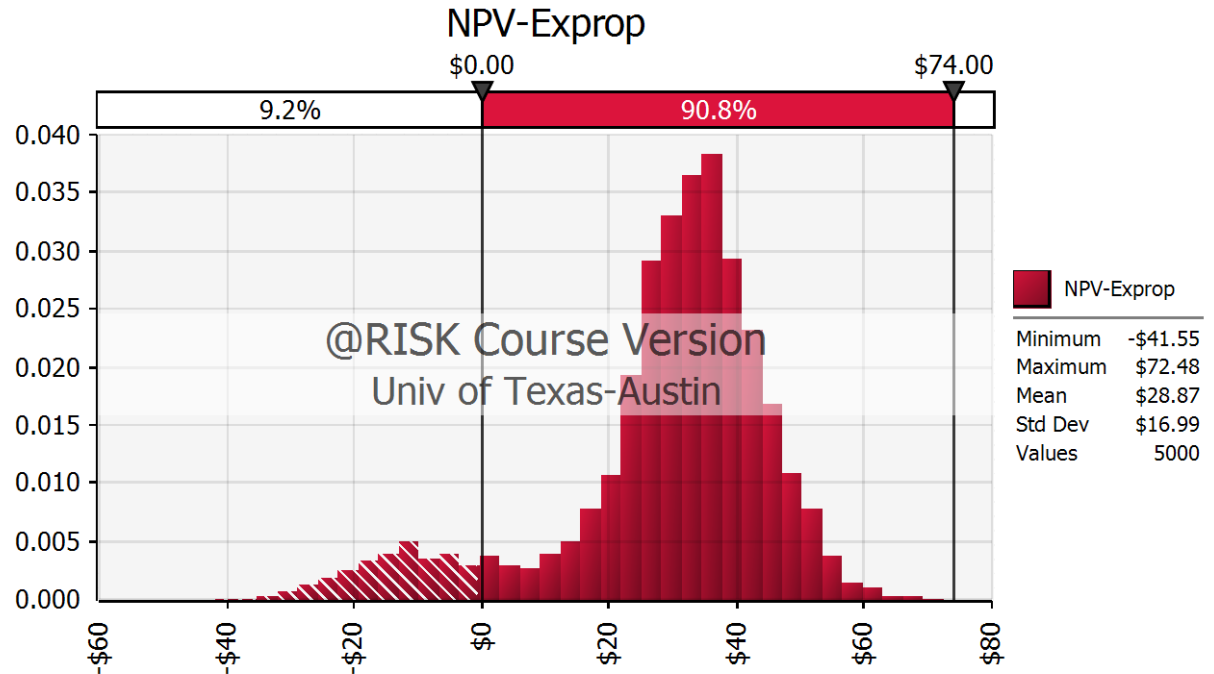
Forecast Assumptions

Use distribution values for

- Future oil production
- Future crude oil price
- Future operating expense
- Future capital expense
- Probability of Force Majeure

Run iterations and get NPV distribution instead of a single NPV value

Output NPV distribution

	Y1	Y2	Y3	Y4	Y5
Risk of expropriation	5%	5%	4%	4%	3%
Senario 1	1	1	-	-	-
Senario 2	1	1	1	1	1
Senario 3	1	1	1	1	-

NPV-Exprop

$0.00 — 9.2% — 90.8% — $74.00

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NPV-Exprop	
Minimum	-$41.55
Maximum	$72.48
Mean	$28.87
Std Dev	$16.99
Values	5000

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Risk-Adjusted Cash Flows Approach

Step 1 **Construct Basic Operating Model**	• **Flexible operating model to capture project fundamentals and discrete effects of relevant variables** • **Free cash flows evaluated deterministically for reasonableness**
Step 2 **Monte Carlo Simulation**	• **Commodity price risk → Mean reverting Brent crude price forecast** • **Production uncertainty → +/- % Via distribution of outcomes** • **Capital cost uncertainty → +/- % Via distribution of outcomes**
Step 3 **Embed Force Majeure Risk**	• **Force Majeure Risk: Probability of a pre-mature termination of project** • **Annual schedule for percent (%) probability of early termination** • **Probability highest in 2012, declines to steady-state for life of project**

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Mean Reverting Price Forecast

Captures Commodity Price Volatility and Market Forces

Forecast Assumptions

Long Run Price - $80/Bbl

- Annual historical data produced $75/Bbl

- Recent macro forces indicate future LRP of $80/Bbl
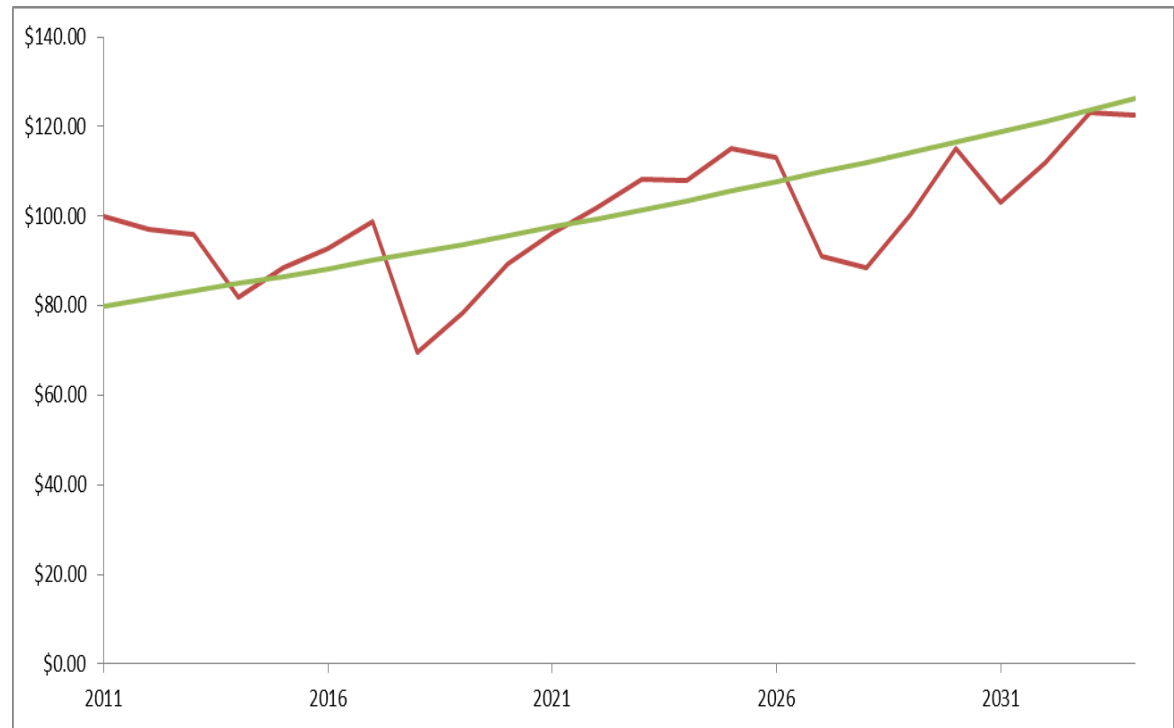
- Price escalation at 2%

Historical Volatility

- $15.70 (18%) according to annual historical data

Mean Reversion Speed

- 0.20 according to annual historical data

Oil Price Trend

Source: Energy Information Agency (EIA) annual Brent Crude prices

Mean Reverting Price Forecast

Captures Commodity Price Volatility and Market Forces

Forecast Assumptions

Long Run Price - $80/Bbl

•Annual historical data produced $75/Bbl

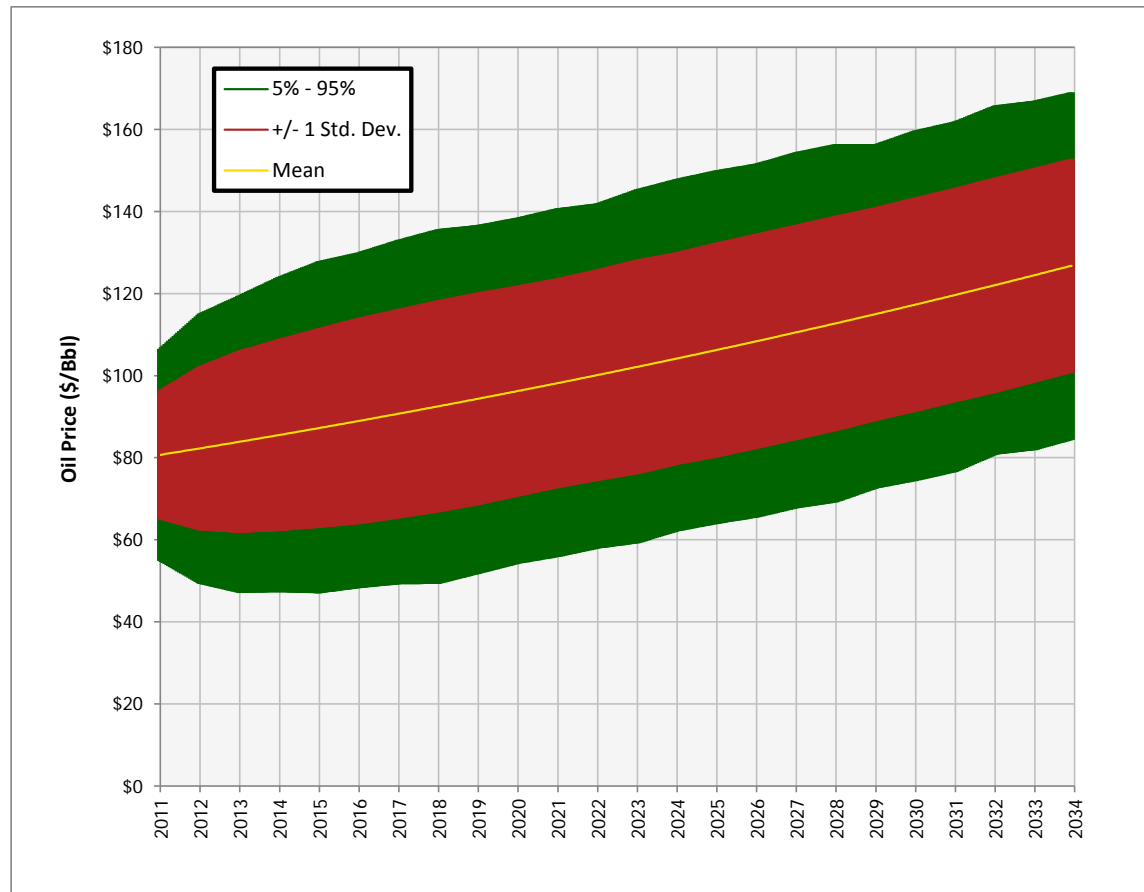•Recent macro forces indicate future LRP of $80/Bbl

•Price escalation at 2%

Historical Volatility

•$15.70 (18%) according to annual historical data

Mean Reversion Speed

•0.20 according to annual historical data

Oil Price Trend - Brent Crude

Legend:
- 5% - 95%
- +/- 1 Std. Dev.
- Mean

Y-axis: Oil Price ($/Bbl), ranging $0 to $180

X-axis: years 2011 to 2034

Source: Energy Information Agency (EIA) annual Brent Crude prices

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Risk-Adjusted Cash Flows Approach

Valuation Methodology:

	1 Base Case	**2** Risk-Adjusted Base Case

	1 Base Case		**2** Risk-Adjusted Base Case
NPV and IRR	$1,659 MM / 17%		$837 MM / 15%
Social Investment Program	Fruktania Proposal		Fruktania Proposal

Negative Impact of Expropriation Risk on Base Case Valuation

Assumptions

Oil Price:

•Mean Reverting Model, Long-Run Price: $80/Bbl

Production: (-10%) / +5%
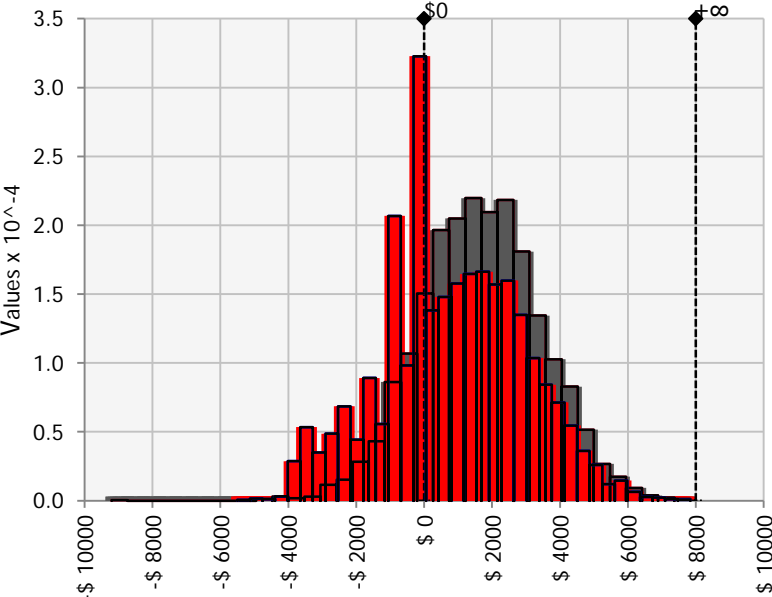
Capital cost: (-10%) / +10%

#2 – Fruktanian Proposal

Force Majeure Risk:

2012: 7.5%

2013: 5%

2014+: 2%

Social Investment:

2011- 2015: $25 MM

2016 – 2034: $5 MM

Retter Corp. lacks control of fund distribution

($ MM USD)

	Base Case	R.A. Base Case
Min	-$5,441	-$5,441
Max	$9,034	$8,315
Mean	$1,659	$837
Stdev	$1,758	$2,092

NPV Impact

1	**Base Case**	**$1,659**
2	**R.A. Base Case**	**$837**
	NPV Change	**($822)**

Project Lifetime Force Majeure Probability

1	**Base Case**	**0%**
2	**R.A. Base Case**	**43%**

Project valuation must account for substantial geopolitical risk –

Retter Social Investment Program can mitigate risk of force majeure
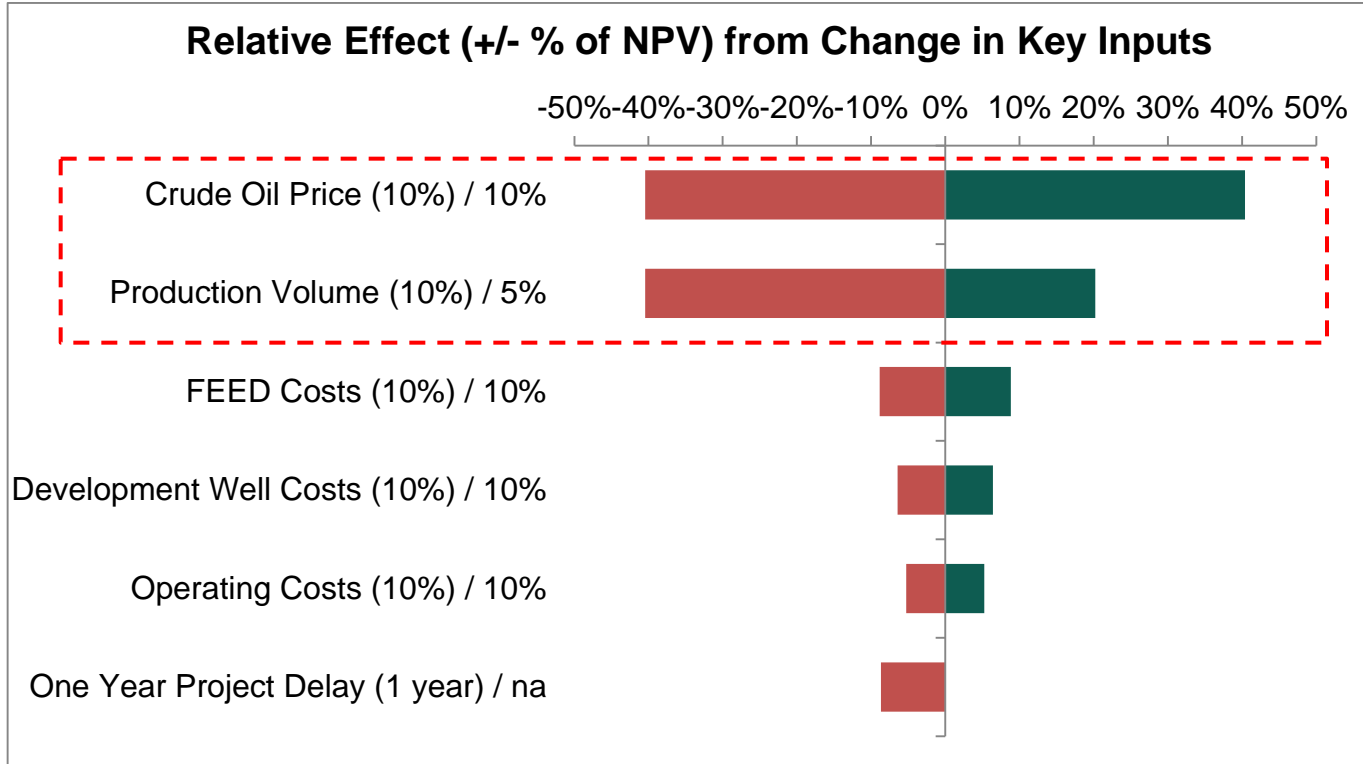
Sensitivity Analysis

Base Case

- Includes Fruktania proposal for social investment

- Does not incorporate Force Majeure Risk

Key Results

- Breakeven Crude Oil Price: **$75/Bbl → 15% IRR**

- Project Delay Effect: 1 Yr. Delay → NPV decrease **$201MM**

Value Drivers for Project Economics

Relative Effect (+/- % of NPV) from Change in Key Inputs

Axis: -50% -40% -30% -20% -10% 0% 10% 20% 30% 40% 50%

- Crude Oil Price (10%) / 10%
- Production Volume (10%) / 5%
- FEED Costs (10%) / 10%
- Development Well Costs (10%) / 10%
- Operating Costs (10%) / 10%
- One Year Project Delay (1 year) / na

Price and production uncertainties have tremendous impact on project value

Conclusion

Key takeaways

Oil price forecasting - Mean reverting model

Expropriation risk – Probability distribution in Monte Carlo simulation

Sensitivity analysis to identify key variables and reduce their uncertanity

Thank You