

Cash Flow at Risk Models: Principles, Application and a Case Study

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Introduction

- **Cash Flow at Risk (CFaR)**
 - A generic label
 - A specific implementation
- **Market Risks**
 - Interest rates, foreign exchange rates and commodity prices
- **Key Performance Metric**
 - Cash Flow, EBITDA or EVA



Principles

- **Market risks are taken together**
- **Risk identification and mapping**
- **Risk measurement**
- **Company specific risk vision**
- **Changing nature of risk and the external environment**
- **Management of risks**



Approach

- **Market risk assessment**
- **Business modelling**
- **Analysis**
- **Stress tests**



Case Study

- **ABC Mining**
- **Melbourne based mining company**
- **Copper mine in Java**
- **Gold mine in WA**
- **Fully hedged US debt**
- **EBITDA Key performance metric**



Case Study

- Market risk assessment

Commodity/Currency		Mean	Standard Deviation	Distribution
US Dollar (per AUD)		0.6000	0.0600	Normal
Rupiah (per AUD)		5,300	795	Normal
Gold (USD per Oz.)		325	20	Lognormal
Copper (USD per Tonne)		1,600	75	Lognormal
Co-variances	US Dollar	Rupiah	Gold	Copper
US Dollar	1.000	0.000	0.750	0.000
Rupiah		1.000	0.000	-0.500
Gold			1.000	0.000
Copper				1.000



Case Study

- Corporate model

	Copper Mine & Smelter	Gold Mine and Smelter
Location	Java, Indonesia	Western Australia
Production	1,000,000 Tonnes	1,500,000 Ounces
Operating Costs	10,000 Billion Rupiah	\$850 Million Australian
Additions to P&E	None	\$750 Million Australian
Sales of P&E	8,500 Billion Rupiah	None

Economic Assumptions	
US Dollar	0.6000 per AUD
Rupiah	5,300 per AUD
Gold	325 USD per Oz.
Copper	1,600 USD per Tonne



Case Study

	Budgeted EBITDA (AUD Millions)	Underlying Position	Forward Program	Options Program
Cash flows from operating activities				
Receipts from customers		3,479	3,479	3,479
Payments to suppliers and employees		-2,887	-2,887	-2,887
Payments for other operating activities		-200	-200	-200
Net cash inflow / (outflow) from operating activities		392	392	392
Net cash inflow / (outflow) from investing activities		-854	-854	-854
Cash flows from financing activities				
Proceeds from / repayments of borrowings		1,000	1,000	1,000
Dividends paid		-100	-100	-100
Option premiums		0	-30	-200
Net cash inflow / (outflow) from financing activities		900	870	700
Budgeted EBITDA		438	408	238



Case Study

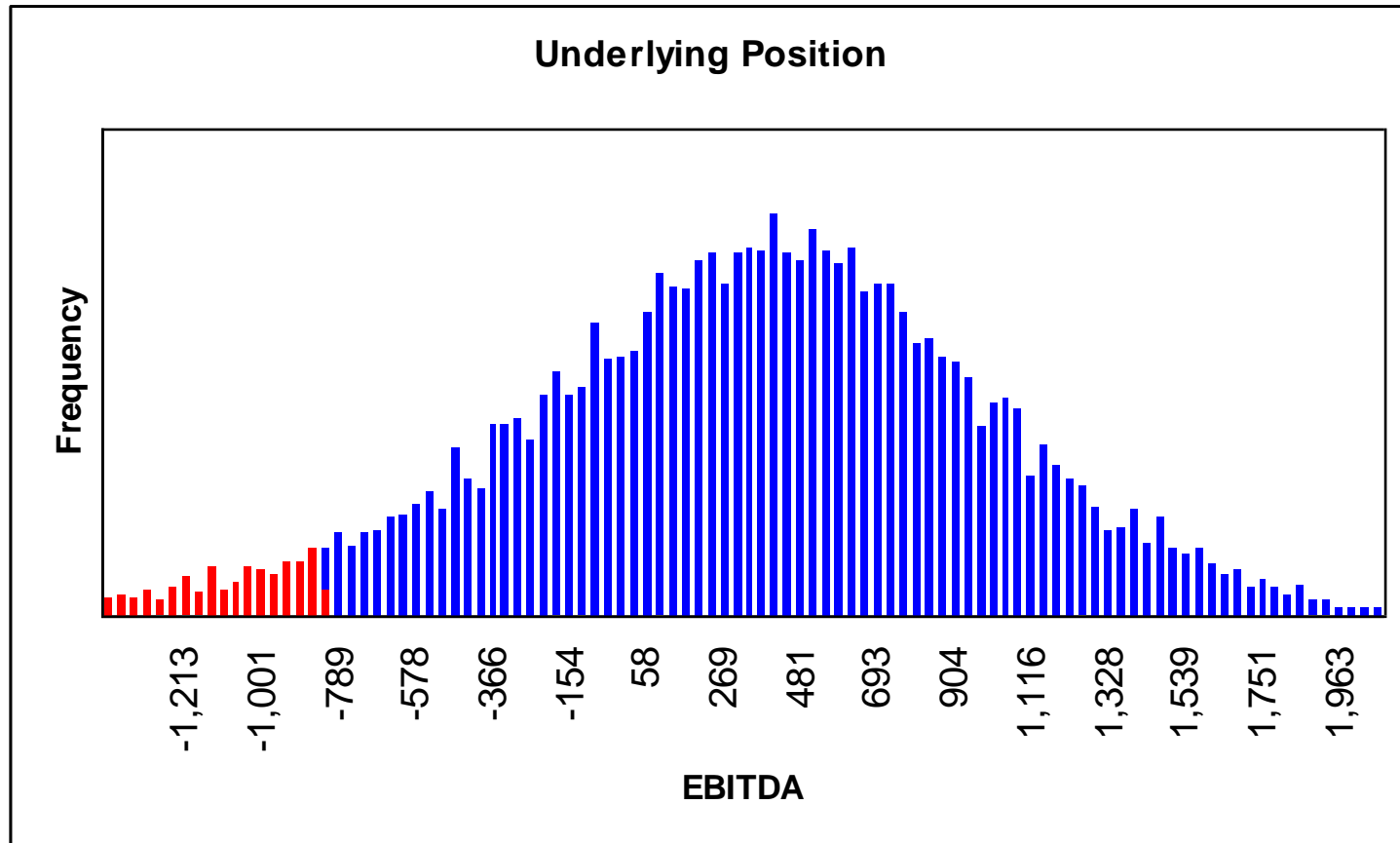
- CFaR Analysis

EBITDA (AUD Millions)	Underlying Position	Forward Program	Options Program
Budget	438	408	238
Mean	390	405	453
Median	425	408	403
Standard Deviation	680	157	489
CFaR at 5.0%	-778	143	-248



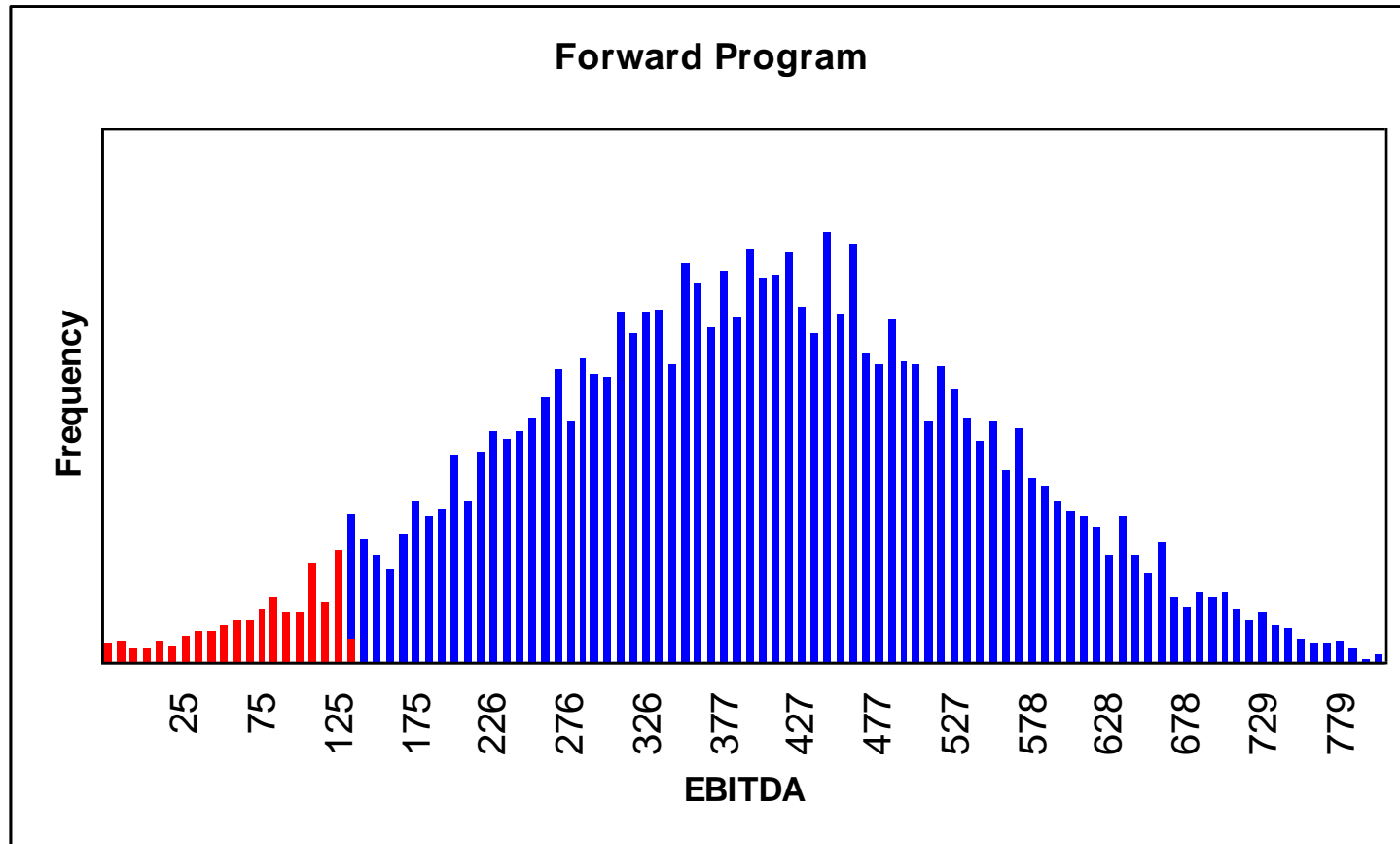
Case Study

- CFaR Analysis



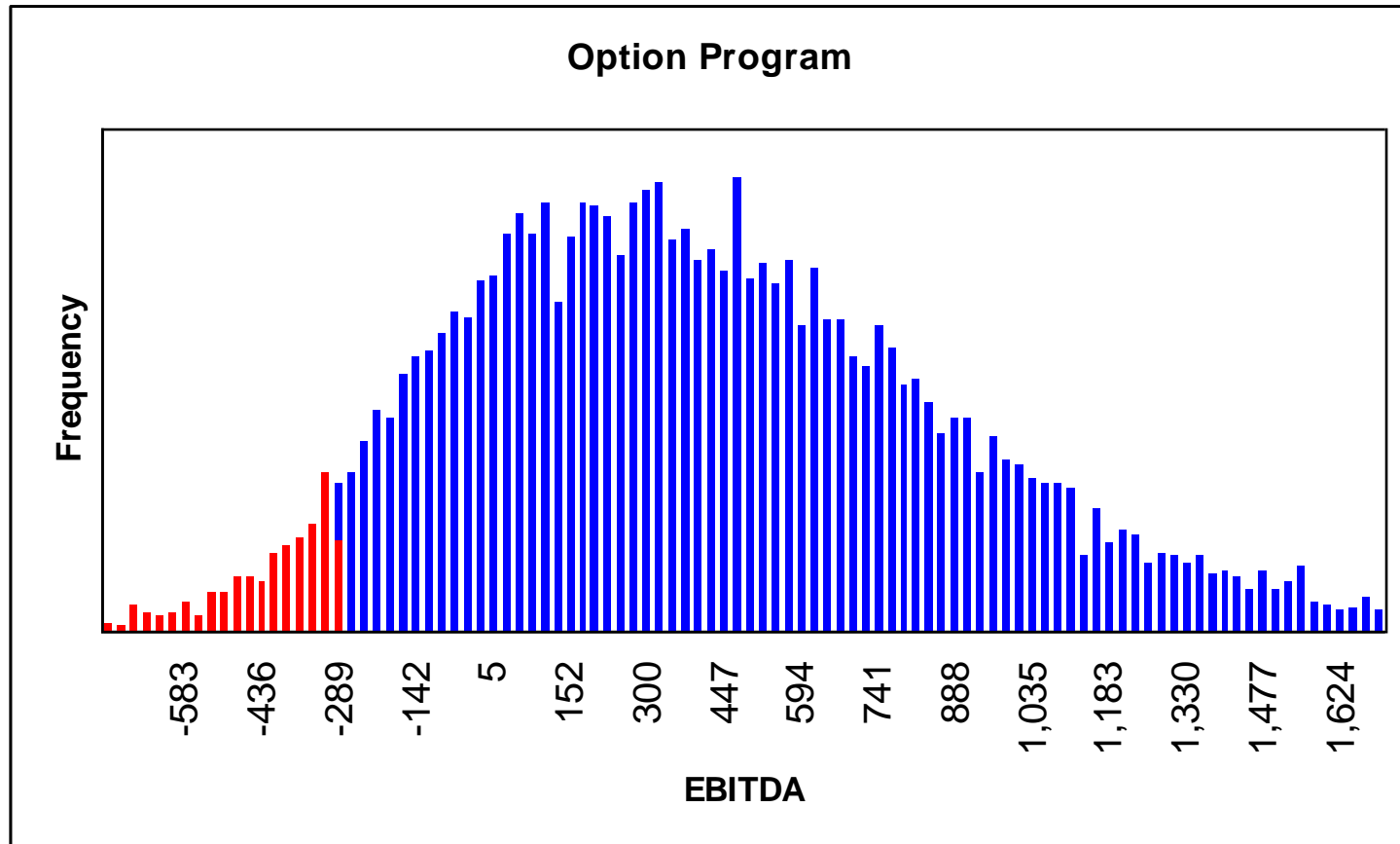
Case Study

- CFaR Analysis



Case Study

- CFaR Analysis



Case Study

• Stress tests	Scenario Description (AUD Millions)	Underlying Scenario EBITDA	Forward Program Scenario EBITDA	Option Program Scenario EBITDA
	AUD = US \$0.75 (AUD appreciates by US \$0.15) and Gold = US \$225 (Gold depreciates by US \$100)	-658	87	-327
	AUD = 3,800 Rupiah (AUD appreciates by 1,500 Rupiah) and Copper = US \$1,200 (Copper depreciates by US \$400)	-1,606	-23	-670
	AUD = US \$0.75 (AUD appreciates by US \$0.15) and Gold = US \$225 (Gold depreciates by US \$100) and AUD = 3,800 Rupiah (AUD appreciates by 1,500 Rupiah) and Copper = US \$1,200 (Copper depreciates by US \$400)	-2,569	-335	-1,243
	AUD = US \$0.45 (AUD depreciates by US \$0.15) and Gold = US \$425 (Gold appreciates by US \$100)	2,264	774	2,064
	AUD = 6,800 Rupiah (AUD depreciates by 1,500 Rupiah) and Copper = US \$2,000 (Copper appreciates by US \$400)	1,875	806	1,675
	AUD = US \$0.45 (AUD depreciates by US \$0.15) and Gold = US \$425 (Gold appreciates by US \$100) and AUD = 6,800 Rupiah (AUD depreciates by 1,500 Rupiah) and Copper = US \$2,000 (Copper appreciates by US \$400)	3,923	1,183	3,723



Case Study

- **Conclusion**

- **Underlying Scenario**

- Huge volatility – up and downside

- **Forward Program**

- Reduced volatility
 - Up-side give away

- **Option Program**

- Reduced volatility
 - Up-side retention
 - High costs



Discussion Prompts

- **Usefulness of approach**
 - High complexity
 - Less dramatic results in on-going management of risk
- **Extensions of approach**
 - Non-market risks
 - Brand Value at Risk
 - Insurance valuation parameters as “Market Risk Factors”



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