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Research Thesis

Real Options Valuation for Petroleum Investments

by

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Table of Contents

Declaration 3

Acknowledgements 4

Table Of Contents 6

Figures 11

Tables 13

Notations 15

Abstract 17

Chapter 1 Introduction 19

1.1 Research Background 19

1.2 The Problem 20

1.3 The Structure of the Thesis 22

Chapter 2 Investments in the Petroleum Industry 25

2.1 Uncertainties in the E&P industry 25

2.2 Risks in the E&P industry 28

2.3 Flexibilities and Options in E&P Projects 30

2.3.2 Options in E & P Projects 32

2.3.3 Evaluating Flexibility 33

Chapter 3 Background for Real Options Valuation 35

3.1 Introduction 35

3.2 Basic Concepts about Real Options 35

3.2.1 Definition of Real Options 35

3.2.2 Real Options Categories 37

3.3 Project Valuation and Valuation Errors 38

3.4 A Review of Traditional Project Valuation Methods 40

3.4.1 Traditional DCF Method 41

3.4.2 Limitations— A valuation system error rather than a model error 42

3.5 Previous Studies of Real Options Valuation 44

3.6 Real Options Valuation and Decision-making 46

3.7 Real Options Theory 47

3.7.1 Financial Options 47

3.7.1.1 An Introduction to Financial Options 47

3.7.1.2 Option Monetary Value 48

3.7.2 Option Pricing Models 49

3.7.2.1 The Binomial Tree Options Model 50

3.7.2.2 The Black-Scholes European Call Option Model 52

3.7.3 Differentiating Risk Definitions Between Finance and Decision Analysis 53

3.7.4 Differences Between Real Options and Financial Options 54

3.7.5 Flexibility in Real Assets 56

3.8 Modelling Uncertainty in Stochastic Processes 58

3.8.1 Geometric Brownian Motion 59

3.8.2 A Popular Oil Pricing Model – The Mean Reverting Model 60

3.9 Using Monte Carlo Simulation to Determine the Project Volatility 61

3.10 Convenience Yield 62

3.10.1 Definition of Convenience Yield 62

3.10.2 Convenience Yield and Oil price 63

3.10.3 Convenience Yield and Project Cash Flows 64

3.10.4 Convenience Yield and Storage Costs 64

3.10.5 Convenience Yield in Real Options Valuation 65

3.10.6 A Model of Convenience Yield 66

3.11 Risk Neutral Probabilities 69

3.12 Value of Information 70

Chapter 4 Real Options Approaches 71

4.1 Introduction 71

4.1.1 Various Real Options Approaches 71

4.1.2 Introduction to the Borison (2003) Paper 72

4.1.2.1 Real options approaches described in this paper 72

4.1.2.2 Reasons for various real options approaches 72

4.1.3 Other approaches 73

4.2 The Classic Approach 74

4.2.1 Assumptions (no arbitrage, market data) 74

4.2.2 Mechanism 75

4.2.2.1 Petroleum Reserves Market Equilibrium 75

4.2.2.2 Important Inputs 75

4.2.2.3 Developed Reserve Value 75

4.2.2.4 Variance 76

4.2.2.5 Expected Exploration and Development Costs 76

4.2.2.6 The model to Value Real Options 76

4.2.3 Conclusion 77

4.3 The Subjective Approach 78

4.3.1 Assumptions (no arbitrage, subjective data) 78

4.3.2 Mechanism 79

4.3.2.1 Project Value 79

4.3.2.2 Inputs 79

4.3.2.3 Project Return Volatility 80

4.3.2.4 Evaluating Value of Flexibility 80

4.3.3 Conclusion 81

4.4 Market Asset Disclaimer (MAD) 83

4.4.1 Assumptions 83

4.4.2 Four Steps in the Market Asset Disclaimer Approach 84

4.4.2.1 Build Up a Present Value Spreadsheet 84

4.4.2.2 Define Uncertainty Variables 85

4.4.2.3 Binomial Tree 87

4.4.2.3.1 Up and Down Factor 87

4.4.2.3.2 Risk Neutral Probabilities [p, 1-p] 87

4.4.2.4 Evolution of Project Value and Net Option Value 87

4.4.3 Conclusion 89

4.5 The Smith Approach 90

4.5.1 Assumptions (two types of risks) 90

4.5.2 Integration of Decision Analysis and Option Price Techniques 91

4.5.3 Three Steps in the Smith Approach 92

4.5.3.1 The Investment Problem in the Incomplete Market 92

4.5.3.2 A Financing Problem in the Complete Market 92

4.5.3.3 Choosing Branch with the Maximum Value 93

4.5.4 Price and Production Models 93

4.5.5 Conclusion 94

4.6. The Luenberger Approach 96

4.6.1 Assumptions (Dual decision trees) 96

4.6.2 The Mechanism 96

4.6.2.1 Private uncertainty 97

4.6.2.2 Market Uncertainty 97

4.6.2.3 Project Value Model 97

4.6.2.4 Time Discrete Decision Tree 98

4.6.3 Conclusion 98

Chapter 5 Case Studies 99

5.1 Case 1: Reservoir Management Project 99

5.1.1 Introduction 99

5.1.2 Project Background 100

5.1.3 Reservoir Management Program 104

5.1.4 Identification of the Option: 104

5.1.5 Uncertainty in the Project 105

5.1.5.1 Gas Price Uncertainty 105

5.1.5.2 Technical Uncertainty 107

5.1.6 Risk and Uncertainty Analysis with the DCF Valuation 113

5.1.7 Real Options Valuation Analysis—Valuing Flexibility 115

5.1.8 Case Solution and Comparison of the 5 Real Options Approaches 117

5.1.9 Real Investment Result 118

5.1.10 Valuation Errors in the Traditional DCF Method 118

5.1.11 Technical Uncertainty and Value of Information 118

5.2 Liquid Gas Distribution Project 119

5.2.1 Case 2 Description 119

5.2.1.1 Project Background 119

5.2.1.2 Strategy 1: Three-phase Liquid Gas Project 120

5.2.1.3 Strategy 2: Two-phase Liquid Gas Project 124

5.2.2 Case 2 Decision Tree 125

5.2.3 Parameters and Variables of the Project 127

5.2.4 Identification of Real Options 128

5.2.5 Risk and Uncertainty in the Project 129

5.2.5.1 World Oil Price Uncertainty 130

5.2.5.2 Costs Uncertainty and Gas Sale Price Uncertainty 133

5.2.5.3 Sales Volume Uncertainty 133

5.2.6 Risk and Uncertainty Analysis Using the Traditional DCF Method 134

5.2.7 Real Option Valuation – Valuing Flexibility 137

5.2.8 Case Solutions and Comparisons for Five Real Options Approaches 139

5.2.8.1 The Classical Approach 139

5.2.8.2 The Subjective Approach 140

5.2.8.3 The MAD Approach 141

5.2.8.4 The Smith Approach 142

5.2.8.5 The Luenberger Approach 144

5.2.9 Summary 146

Chapter 6: Conclusion and Recommendation 148

6.1 Conclusion 148

6.2 Recommendation 150

References 152

Appendix A: Fetkovich Decline Curve Analysis Features 160

Appendix B: Li-Horne Model Decline Analysis Models for Production Forecasting 163

Appendix C: Real Option Equations for Case 1 165

C-3 The Classical Approach 171

C-4 The Subjective Approach 173

C-5 The Market Asset Disclaimer 175

C-6 The Smith Approach 178

C-7 The Luenberger Approach 181

Abstract

In many instances, oil companies struggle with decisions pertaining to petroleum investment. The difficulty partially stems from the uncertainties in many of the inherent variables. Furthermore, conventional investment methods often fail to properly identify available opportunities.

As commonly acknowledged, traditional valuation methods such as Discounted Cash Flow (DCF) and Net Present Value (NPV) analyses are unable to properly portray investment opportunities. Due to large uncertainties and hence risk in Petroleum Exploration and Production (E & P), investors are gradually turning to a more dynamic approach to investment decisions.

Real Options Valuation involves a methodology for evaluating the value of an opportunity, leading to a strategic decision in an uncertain environment. Based on academic research in finance and business management, Real Options Valuation may be extended from option-pricing tools of the finance sector to that of evaluating E & P projects. In other words, although Real Options thinking has been widely accepted and used in some cases, the wider use of the Real Options approach is still a "hot" debate in the petroleum industry.

A permissible definition of "Real Options" may lead to inconsistencies among Real Options approaches. As such, Real Options may be defined as a company having a right, not an obligation, to invest in a future opportunity. The opportunity may involve technical aspects or may be purely commercial in nature. In all cases a quantitative approach is required. In the work by Borison (2003) and Bratvold et al (2005), the authors have listed five Real Option methodologies: the Classic approach, the Subjective approach, the Market Disclaimer approach

(MAD), the Smith approach, and the Luenberger approach. A comparative analysis of these Real Option approaches is presented in this thesis.

In comparing the above-mentioned Real Options approaches, it is apparent that two types of uncertainties may be considered: technical and market. In the study presented, two petroleum cases are considered: a technical uncertainty dominated case and a market uncertainty dominated case. The technical uncertainty dominated case is related to reservoir management. The market uncertainty dominated case involves a Liquid Petroleum Gas (LPG) distribution project. The case studies presented demonstrate the functionality of the five Real Options approaches.

This research is multi-disciplinary in nature, integrating the finance option theory with petroleum engineering projects, as well as project management. As such, it is shown that the petroleum industry could benefit from using Real Options Valuation in their investment strategy, thus improving petroleum business performance.