# Table of contents

**Preface**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>ix</td>
</tr>
</tbody>
</table>

**CHAPTER 1**

**INTRODUCTION**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
</tbody>
</table>

**CHAPTER 2**

**THE NORMAL PROBABILITY DISTRIBUTION**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation in a financial market</td>
<td>8</td>
</tr>
<tr>
<td>The impact of volatility and time on the standard deviation</td>
<td>8</td>
</tr>
</tbody>
</table>

**CHAPTER 3**

**VOLATILITY**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The probability distribution of the value of a Future after one year of trading</td>
<td>11</td>
</tr>
<tr>
<td>Normal distribution versus log-normal distribution</td>
<td>11</td>
</tr>
<tr>
<td>Calculating the annualised volatility traditionally</td>
<td>15</td>
</tr>
<tr>
<td>Calculating the annualised volatility without μ</td>
<td>17</td>
</tr>
<tr>
<td>Calculating the annualised volatility applying the 16% rule</td>
<td>19</td>
</tr>
<tr>
<td>Variation in trading days</td>
<td>20</td>
</tr>
<tr>
<td>Approach towards intraday volatility</td>
<td>20</td>
</tr>
<tr>
<td>Historical versus implied volatility</td>
<td>23</td>
</tr>
</tbody>
</table>

**CHAPTER 4**

**PUT CALL PARITY**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetically creating a Future long position, the reversal</td>
<td>29</td>
</tr>
<tr>
<td>Synthetically creating a Future short position, the conversion</td>
<td>30</td>
</tr>
<tr>
<td>Synthetic options</td>
<td>31</td>
</tr>
<tr>
<td>Covered call writing</td>
<td>34</td>
</tr>
<tr>
<td>Short note on interest rates</td>
<td>35</td>
</tr>
</tbody>
</table>
### CHAPTER 5
**DELTA ∆**
- Change of option value through the delta 37
- Dynamic delta 38
- Delta at different maturities 40
- Delta at different volatilities 41
- 20–80 Delta region 44
- Delta per strike 46
- Dynamic delta hedging 47
- The at the money delta 50
- Delta changes in time 53

### CHAPTER 6
**PRICING**
- Calculating the at the money straddle using Black and Scholes formula 55
- Determining the value of an at the money straddle 57

### CHAPTER 7
**DELTA II**
- Determining the boundaries of the delta 61
- Valuation of the at the money delta 61
- Delta distribution in relation to the at the money straddle 64
- Application of the delta approach, determining the delta of a call spread 65

### CHAPTER 8
**GAMMA**
- The aggregate gamma for a portfolio of options 71
- The delta change of an option 73
- The gamma is not a constant 75
- Long term gamma example 76
- Short term gamma example 77
- Very short term gamma example 77
- Determining the boundaries of gamma 78
- Determining the gamma value of an at the money straddle 79
- Gamma in relation to time to maturity, volatility and the underlying level 80
- Practical example 82
- Hedging the gamma 85
- Determining the gamma of out of the money options 87
- Derivatives of the gamma 89
# Table of contents

## CHAPTER 9
**VEGA**
- Different maturities will display different volatility regime changes 93
- Determining the vega value of at the money options 95
- Vega of at the money options compared to volatility 96
- Vega of at the money options compared to time to maturity 97
- Vega of at the money options compared to the underlying level 99
- Vega on a 3-dimensional scale, vega vs maturity and vega vs volatility 99
- Determining the boundaries of vega 101
- Comparing the boundaries of vega with the boundaries of gamma 102
- Determining vega values of out of the money options 104
- Vomma 105

## CHAPTER 10
**THETA**
- A practical example 111
- Theta in relation to volatility 112
- Theta in relation to time to maturity 114
- Theta of at the money options in relation to the underlying level 115
- Determining the boundaries of theta 117
- The gamma theta relationship 118
- Theta on a 3-dimensional scale, theta vs maturity and theta vs volatility 120
- Determining the theta value of an at the money straddle 126
- Determining theta values of out of the money options 127

## CHAPTER 11
**SKEW**
- Volatility smiles with different times to maturity 131
- Sticky at the money volatility 133

## CHAPTER 12
**SPREADS**
- Call spread (horizontal) 135
- Put spread (horizontal) 137
- Boxes 138
- Applying boxes in the real market 139
- The Greeks for horizontal spreads 140
- Time spread 146
- Approximation of the value of at the money spreads 148
- Ratio spread 149
TABLE OF CONTENTS

CHAPTER 13
    BUTTERFLY  155

- Put call parity  158
- Distribution of the butterfly  159
- Boundaries of the butterfly  161
- Method for estimating at the money butterfly values  163
- Estimating out of the money butterfly values  164
- Butterfly in relation to volatility  165
- Butterfly in relation to time to maturity  166
- Butterfly as a strategic play  166
- The Greeks of a butterfly  167
- Straddle–strangle or the “Iron fly”  171

CHAPTER 14
    STRATEGIES  173

- Call  173
- Put  174
- Call spread  175
- Ratio spread  176
- Straddle  177
- Strangle  178
- Collar (risk reversal, fence)  178
- Gamma portfolio  179
- Gamma hedging strategies based on Monte Carlo scenarios  180
- Setting up a gamma position on the back of prevailing kurtosis in the market  190
- Excess kurtosis  191
- Benefitting from a platykurtic environment  192
- The mesokurtic market  193
- The leptokurtic market  193
- Transition from a platykurtic environment towards a leptokurtic environment  194
- Wrong hedging strategy: Killergamma  195
- Vega convexity/Vomma  196
- Vega convexity in relation to time/Veta  202

INDEX  205