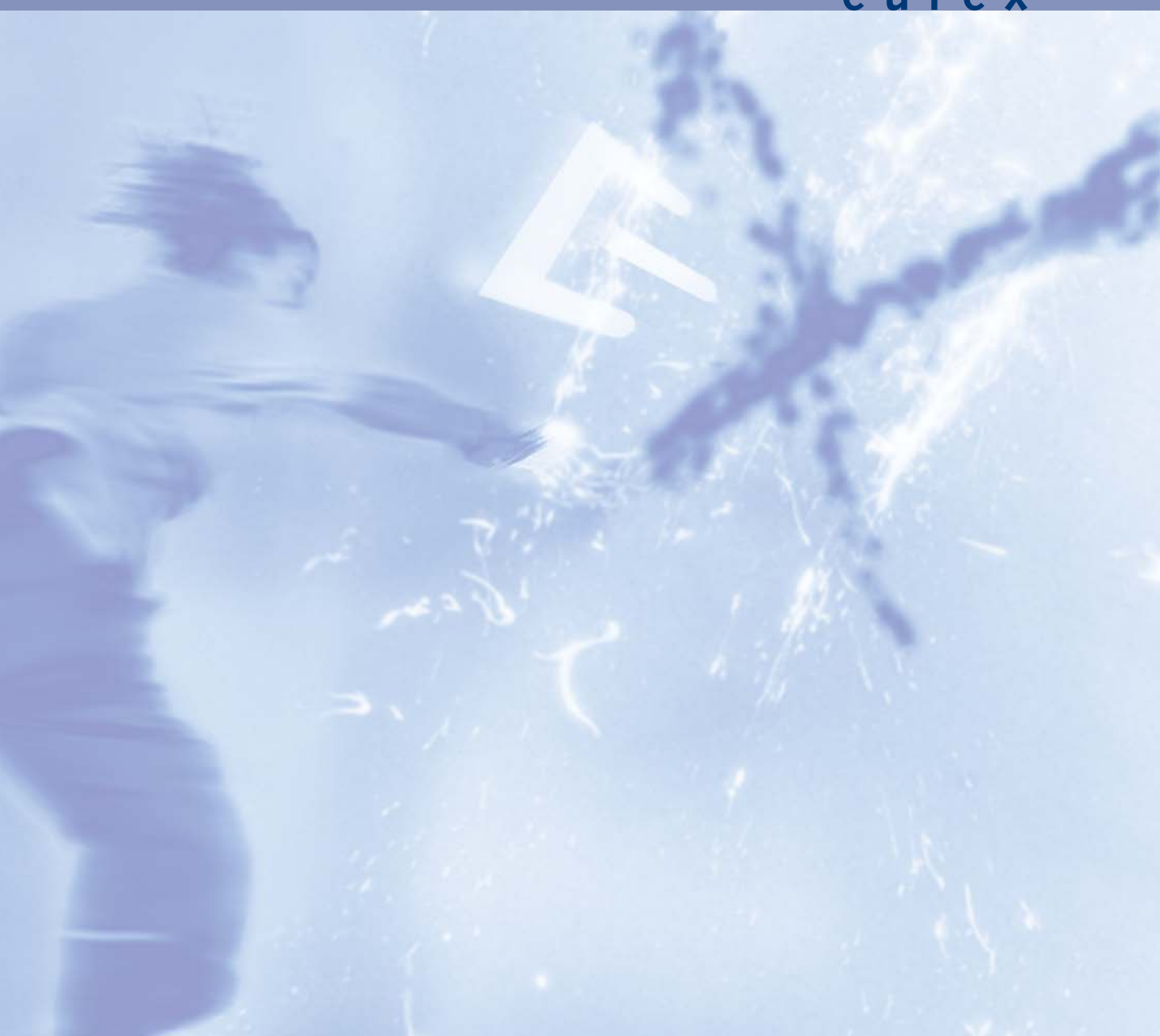
Equity and Equity Index Derivatives

Trading Strategies – Questions and Case Studies

eurex



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Trading Strategies – Questions and Case Studies

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Contents – Exercises

Contents – Solutions

Questions

Case Studies

Workbook-Structure and Objectives

This workbook provides you with the opportunity to apply and review your knowledge of equity and equity index derivatives traded on Eurex. You will be asked a variety of questions, based on the brochure **"Equity and Equity Index Derivatives – Trading Strategies"**. The answers should familiarize you with this particular market segment and enhance your understanding of the contracts traded on Eurex. Furthermore, the case studies on selected key topics allow you to put your knowledge and experience into practice.

To facilitate the use of the workbook, the questions and case studies relate to the key topics of the brochure **"Equity and Equity Index Derivatives – Trading Strategies"**. You can use the brochure as a reference to work out the solutions. The workbook also contains proposed solutions to the questions and case studies, which serve to check your progress.

You will require a calculator to work out the tasks set out in this workbook, as well as the brochure **"Eurex Products"** and the **"Trading Calendar"**.

Exercises

Fundamental Terms of Securities Management

Exercise 1

Please name one of the most important and widely-read publications on portfolio theory.

Exercise 2

Please evaluate whether the following statement is true or false:
"The return on an equity portfolio is derived from adding the individual returns on the shares contained in the portfolio, according to their individual weighting."

Exercise 3

What comprises the return on a share?

Exercise 4

Please evaluate the accuracy of the following statement, stating reasons for your answer:
"The risk associated with an equity investment is defined in portfolio theory (Markowitz's "Portfolio Selection Model") as the risk of a decline in share prices."

Exercise 5

Please name a statistical measure for the risk associated with an investment vehicle.

Exercise 6

What values can the correlation coefficient assume?

Exercise 7

What correlation of two shares can completely eliminate any risk in a portfolio comprising these two shares?

Exercise 8

What portfolios are referred to as "efficient"?

Exercise 9

What is meant by systematic risk?

Exercise 10

What factors are taken into consideration in an evaluation of unsystematic risk?

Exercise 11

What does the beta factor reflect?

Exercise 12

If the beta factor equals one, how does the share price react relative to the market?

Exercise 13

If the beta factor is less than one, how does the share price react relative to the market?

Exercise 14

What is meant by diversification?

Exercise 15

What risk can be minimized through diversification?

Exercise 16

What must be taken into consideration with diversification to achieve a risk-reducing effect for the equity portfolio?

Exercise 17

What correlation factor between two shares will result in no reduction in risk, if the two shares are combined in a single portfolio?

Exercise 18

Please explain why the volatility of a diversified portfolio is not simply derived from the weighted sum of the volatilities of the portfolio's individual component shares.

Characteristics of Derivative Financial Instruments

Exercise 19

What is the principal use of derivative instruments?

Exercise 20

Please describe the meaning of the leverage effect.

Exercise 21

Please define unconditional forward transactions (futures).

Exercise 22

Please define conditional forward transactions (options).

Introduction to Equity Index Futures

Exercise 23

How do the contractual terms of derivatives traded on futures and options exchanges differ from OTC derivatives?

Exercise 24

As a rule, what obligations does the buyer of an equity index futures contract enter into?

Exercise 25

What position results from selling a futures contract?

Exercise 26

How are Eurex equity index futures settled? Please state the reasons for this type of settlement.

Exercise 27

What do you understand by the term "closing out"?

Exercise 28

True or false? "Both buyers and sellers of futures contracts can close out their positions at any time during trading hours (provided markets are liquid)."

Exercise 29

Which maturity months are normally available for equity index futures traded on Eurex, on May 5 of any one year?

Exercise 30

What is the value of an SMI® Futures contract if it is currently trading at 6,142 points?

Exercise 31

What is the last trading day within a maturity month for all Eurex equity index futures contracts?

Exercise 32

What is the minimum price change of a futures contract called?

Exercise 33

Who or what is the counterparty for each transaction entered into on Eurex?

Exercise 34

What is purpose of the margins?

Exercise 35

For equity index futures contracts, what risk is covered by Additional Margin and Futures Spread Margin?

Exercise 36

Please describe equity index futures spread positions.

Exercise 37

Please explain why Futures Spread Margin rates are considerably lower than Additional Margin rates.

Exercise 38

How is the leverage effect created with equity index futures?

Exercise 39

Please describe the mark-to-market process.

Exercise 40

How is Variation Margin settled?

Exercise 41

How is the Variation Margin calculated on the day on which a new long futures position is entered into?

Exercise 42

Please comment on the following statement: "Variation Margin does not constitute collateral pledged to cover price risk."

Exercise 43

What position on the market results in the margin account being debited when underlying prices fall?

Futures Pricing

Exercise 44

Please name the two types of indexes which differentiate between taking or not taking dividends into consideration when calculating the index.

Exercise 45

What type of index assumes that all income from dividends and subscription rights is re-invested?

Exercise 46

Please state the formula for calculation of the theoretical index futures price.

Exercise 47

What term is used to describe the difference between the price of the equity index futures contract and the cash index, and how is it calculated?

Exercise 48

Is the following statement true or false? "The cost of carry typically increases as the remaining lifetime of the futures contract declines." Please substantiate your answer.

Exercise 49

Why are dividends not taken into consideration when calculating the cost of carry of the DAX® and TecDAX® Futures?

Exercise 50

Can an equity index futures contract trade below the price of the underlying instrument (cash index)?

Equity Index Futures Strategies

Exercise 51

What futures position has a risk profile almost identical to that of an equity portfolio?

Exercise 52

With which futures position can an investor speculate on falling prices?

Exercise 53

What must the holder of long futures positions observe with regard to payments that might be incurred during the position lifetime, if prices fall?

Exercise 54

What price development does the holder of a short index futures position anticipate?

Exercise 55

What equity position has a risk profile comparable with that of a short index futures position?

Exercise 56

Is the following statement true or false? "Contrary to long futures positions, no margin must be pledged for covered short futures positions." Please substantiate your answer.

Exercise 57

On August 13, an investor sells 30 DAX® Futures at a price of 3,512 points. On the basis of the market data provided in the table below, please calculate the Variation Margin payable in the following days and the total profit/loss on the position.

Date	Daily settlement price (points)	Variation Margin (points)	Index multiplier (EUR/point)	Number of contracts	Variation Margin (EUR)
August 13	3,470				
August 14	3,492				
August 15	3,440				
Total	–				

Exercise 58

Is Additional Margin pledged by an investor when entering into a position repaid after this position is closed out? Please substantiate your answer.

Exercise 59

Please define the term "spread".

Exercise 60

What determines the theoretical price level for a time spread?

Exercise 61

How does the (time) spread of futures based on performance indexes change for rising index prices, assuming all other factors remain unchanged? Does the spread widen or narrow?

Exercise 62

You want to hedge your equity portfolio against falling prices. What hedging strategy with equity index futures contracts can you enter into and what does this entail?

Exercise 63

What risk parameters do you require for a portfolio hedge with futures contracts, and what formula is used to calculate the number of futures contracts required for a total hedge?

Exercise 64

In May, you secure an order to build up a diversified portfolio of German equities. However, the liquid funds for the investment are not available until September. How do you hedge against rising prices?

Exercise 65

You hold a well-diversified portfolio of German equities with a current market value of EUR 3,000,000. The DAX® is trading at 5,175 points. You have calculated a portfolio beta of 1.15. You plan a short-term hedge against falling prices for half your portfolio. How many DAX® Futures contracts do you sell?

Exercise 66

An investor expects to receive a capital sum of CHF 2,000,000 in one month's time, which he wants to invest in a well-diversified portfolio of Swiss equities.
He calculates a portfolio beta of 1.1 for the planned portfolio. The SMI® is trading at 6,620 points. How many SMI® Futures contracts does he buy for a total hedge against rising prices in the intervening period on the Swiss equity market?

Introduction to Equity and Equity Index Options

Exercise 67

What is the price called at which the option holder can buy or sell the underlying instrument?

Exercise 68

What is the term for the instrument on which the option is based?

Exercise 69

True or false? "The holder of an American-stye option can only exercise his right at the end of the option's lifetime."

Exercise 70

Please define the term "contract size" for options.

Exercise 70

The holder of which type of option has the right to sell the underlying instrument?

Exercise 72

Selling options is known as entering into a ... position?

Exercise 73

A long call can only be closed out by which particular transaction – assuming identical lifetime and exercise price and the same underlying instrument?

Exercise 74

Please state the obligation of a put seller.

Exercise 75

Let us assume you buy five BMW option contracts at a unit price of EUR 2.20. What is the total option premium payable?

Exercise 76

When is the premium paid for Eurex equity and equity index options?

Exercise 77

What margin must the option buyer pledge? Please substantiate your answer.

Exercise 78

What margin must the option seller pledge? Please substantiate your answer.

Exercise 79

What does the Premium Margin cover?

Exercise 80

What is covered by Additional Margin?

Exercise 81

When is no margin required for a short position in equity options?

Options Pricing

Exercise 82

What two components comprise the option price?

Exercise 83

When does a put option have an intrinsic value?

Exercise 84

The exercise price of a call option is EUR 50. The option's underlying share is currently trading at EUR 61. What is the intrinsic value of the option?

Exercise 85

What component of the option price reflects the expectations of market participants?

Exercise 86

True or false? "Time value increases, the closer an option approaches its expiration date."

Exercise 87

Please define the volatility of the underlying instrument.

Exercise 88

Which volatility is based on historical data?

Exercise 89

Amongst holders of option positions, for whom does the passage of time work in favor? Please substantiate your answer.

Exercise 90

Is the option buyer entitled to receive dividend payments on the underlying instrument?

Exercise 91

What impact does a dividend payment have on the price of a call or put option, respectively?

Exercise 92

How do rising interest rates impact on the value of the call option?

Exercise 93

Please complete the following tables:

The price of the call is higher,	**The price of the call is lower,**
the _____ the price of the underlying instrument,	the _____ the price of the underlying instrument,
the _____ the exercise price,	the _____ the exercise price,
the _____ the remaining lifetime,	the _____ the remaining lifetime,
the _____ the volatility,	the _____ the volatility,
the _____ the interest rate,	the _____ the interest rate,
the _____ the dividend.	the _____ the dividend.

The price of the put is higher,	**The price of the put is lower,**
the _____ the price of the underlying instrument,	the _____ the price of the underlying instrument,
the _____ the exercise price,	the _____ the exercise price,
the _____ the remaining lifetime,	the _____ the remaining lifetime,*
the _____ the volatility,	the _____ the volatility,
the _____ the interest rate,	the _____ the interest rate,
the _____ the dividend.	the _____ the dividend.

* Some exceptions to this rule can apply to deep in-the-money European-style puts.

Important Risk Parameters – "Greeks"

Exercise 94

What does the delta factor describe?

Exercise 95

What is the value range of the long call delta?

Exercise 96

What is the value range of the long put delta?

Exercise 97

The value of a call option on Siemens shares is EUR 10. The option's delta is 0.65. What is the estimated value of the option, following a short-term rise in the Siemens share price by EUR 2?

Exercise 98

A long call is at-the-money. What is the option delta?

Exercise 99

A long put is at-the-money. What is the option delta?

Exercise 100

What risk parameter indicates the change in the delta?

Exercise 101

When is the gamma at its highest level?

Exercise 102

You hold an at-the-money call on Siemens. The price of the Siemens share starts to rise. Will the call rise in value, if share prices continue to rise to the same extent (in absolute terms) as they did in the past?

Exercise 103

What does the vega (also called kappa) measure?

Exercise 104

When is an option's time value decay greatest, and what indicator is used to reflect this?

Exercise 105

Which formula is used to calculate the leverage effect (omega) of an option?

Strategies for Stock Options and Equity Index Options

Exercise 106

You expect a short-term sharp increase in the BMW share, but are not prepared to risk major losses should the share price fall. Which options position do you choose?

Exercise 107

In February, you expect the Deutsche Bank share price to fall slightly or remain constant in the medium-term. Which options position do you choose?

Exercise 108

You expect the VW share to stagnate or to rise only slightly. You consider it highly unlikely that it will fall. Which options position do you choose?

Exercise 109

Nokia's quarterly figures are expected soon. Your equity analyst concludes they will be considerably worse than anticipated by the market. Which option strategy allows you to benefit the most, assuming this forecast is correct?

Exercise 110

Which basic option strategies benefit from falling volatility?

Exercise 111

What is the maximum loss that a call buyer can incur?

Exercise 112

You hold a long call on Henkel preferred shares. The exercise price is EUR 75. You have paid a premium of EUR 2.35. At what price do you break even at the end of the option's lifetime?

Exercise 113

An investor sells a DaimlerChrysler Call (DCX) with an exercise price of EUR 52.50 at an option price of EUR 2.10. At what share price is maximum profit made at the end of the option's lifetime?

Exercise 114

What is the maximum loss that can be incurred on a short call?

Exercise 115

Which basic option positions comprise a bull call spread? Does the investor pay or receive a net premium? Is this position subject to margin requirements?

Exercise 116

The DaimlerChrysler share (DCX) is trading at EUR 48.92 on June 13. The DCX September Call with an exercise price of EUR 50.00 is offered at EUR 3.15, while the September Call with an exercise price of EUR 52.50 is traded at EUR 2.13. What is the maximum profit at the end of the lifetime of a EUR 50.00 – EUR 52.50 bull call spread?

Exercise 117

On June 12, the Lufthansa (LHA) share price is EUR 14.40. You buy a bull call spread on LHA with exercise prices of EUR 15.00 and EUR 17.00. The option prices are EUR 0.81 for the 15.00 call and EUR 0.36 for the 17.00 call. Please calculate your P/L, if the Lufthansa share is trading at EUR 16.85 at the end of the lifetime.

Exercise 118

Which basic option positions comprise a bull put spread? Does the investor pay or receive a net premium?

Exercise 119

Is a bull put spread subject to margin requirements? Please substantiate your answer.

Exercise 120

Is the bull put spread delta positive or negative? Please substantiate your answer.

Exercise 121

The Dow Jones EURO STOXX 50® Index is trading at 3,080 points on June 14. You expect the index to fall to 3,000 points by the time the options expire in August. The index multiplier of the Dow Jones EURO STOXX 50® Options is EUR 10. Please calculate the net premium for a bear put spread and a bear call spread on the basis of the following table.

Exercise price (points)	Call prices (points)	Put prices (points)
3,100	115.20	177.00
3,000	167.40	129.90

Exercise 122

What is the maximum profit on the bear put spread in the previous example, and at what Dow Jones EURO STOXX 50® Index level is this profit made?

Exercise 123

Which basic option positions comprise a long straddle?

Exercise 124

What are the investor's market expectations when buying a straddle?

Exercise 125

What margin must be pledged for a long straddle?

Exercise 126

What are the expectations of the seller of a straddle?

Exercise 127

What is the maximum theoretical loss that can be incurred on a short straddle?

Exercise 128

Which basic option positions comprise a long strangle?

Exercise 129

What are the investor's market expectations when selling a strangle?

Hedging Strategies Using Stock Options and Equity Index Options

Exercise 130

Your portfolio consists of VW shares only, which you want to protect against a falling share price. To fully hedge the risk, do you need to buy put options on VW, or on the DAX®?

Exercise 131

What strategy can be used to achieve an additional return on an existing equity portfolio, assuming prices remain stable?

Exercise 132

What is the market expectation of an investor holding a covered short call position?

Exercise 133

Are short calls always subject to margin requirements? Please substantiate your answer.

Exercise 134

What are the prerequisites of an equity portfolio to allow for an appropriate hedging strategy using index options?

Exercise 135

Which two parameters should be observed when hedging an equity portfolio using equity index options?

Exercise 136

Which indicator can be used to measure the fluctuation of an individual share price relative to the index?

Exercise 137

How do you calculate the beta factor of an equity portfolio?

Exercise 138

Please calculate the beta factor of the following equity portfolio relative to the Dow Jones EURO STOXX 50® Index:

Quantity	Issue	Entry price (EUR)	Current price (EUR)	Beta factor	Market value (EUR)
1,900	VW	52.41	60.33	0.89	114,627
1,200	Deutsche Bank	74.38	69.52	1.24	83,424
900	Bayer	36.53	32.95	0.87	29,655
Total portfolio value					**227,706**

Exercise 139

Please calculate the number of option contracts necessary to hedge a given minimum value for the portfolio from the previous exercise. The Dow Jones EURO STOXX 50® Index is trading at 3,120 points.

Exercise 140

Why do residual risks remain even when an equity portfolio is, in theory, totally hedged?

Exercise 141

What are the components of a synthetic long call on the DAX®?

Exercise 142

What are the components of a synthetic short call on the SMI®?

Exercise 143

Please describe the components of a synthetic long put on the TecDAX®.

Exercise 144

What are the components of a synthetic short put on the Dow Jones STOXX 50®?

Exercise 145

What synthetic position is created by combining a long call and a short put on the EURO STOXX 50®?

Exercise 146

Please describe a conversion strategy.

Exercise 147

What option positions must be combined to generate a synthetic short index futures position?

Exercise 148

What comprises a reversal strategy?

Exercise 149

Please complete the following table:

A synthetic ...	**is created by combining**		
	Call	Put	Future
Long call			
Short call			
Long put			
Short put			
Long Future			
Short Future			

Return on a Portfolio

Exercise 150

On June 18, you hold the following equity portfolio which you established this year in January:

Share	Quantity	Price on January 2 in EUR	Return on the share since January 2
DaimlerChrysler	2,000	46.58	12.80 %
Nestlé	500	233.71	11.10 %
Allianz	600	270.26	–10.90 %
Swiss Re	800	111.69	–2.40 %
Siemens	1,800	73.42	–10.11 %
Hagemayer	80,000	2.87	–43.90 %

The Dow Jones STOXX 50® Index has fallen by 7.40 percent since January 2 and is currently trading at 3,357.70 points.

Please calculate the return on your equity portfolio. How did your portfolio perform compared with the Dow Jones STOXX 50®?

Eurex Equity Index Futures Contract Values

Exercise 151

Please state the multipliers for the following Eurex equity index futures contracts and calculate the contract values using the given prices:

Underlying instrument	Product code	Index multiplier	Futures price	Contract value
DAX®	FDAX		4,475	
TecDAX®	FTDX		683	
SMI®	FSMI		6,161	
Dow Jones EURO STOXX 50®	FESX		3,193	

Futures Spread Margin, Additional Margin and Leverage Effect

Exercise 152

On June 17, you enter into a long position comprising 25 Dow Jones STOXX 50® September Futures contracts at a price of 3,117. The additional margin parameter for the STXX margin class is EUR 2,700. What Additional Margin must be pledged for this position and how high is the leverage effect (value of the position relative to the capital investment)?

On June 18, you sell 25 Dow Jones STOXX 50® December Futures contracts against your existing position. What is the Spread Margin for this position? The Spread Margin parameter for the STXX margin class is EUR 150.

Variation Margin

Exercise 153

On November 25, you enter into a long position comprising 17 DAX® Futures contracts at a price of 4,735. Please calculate the Variation Margin for the corresponding daily settlement prices until the position is closed out on November 28, and state the total profit/loss on the position.

Date	Settlement price	Profit/loss (index points)	Point value (EUR)	Number of contracts	Variation Margin (EUR)
November 25	4,705				
November 26	4,742				
November 27	4,726				
November 28	4,778				
Total	–		–		

Futures Pricing: Fair Value

Exercise 154

Please calculate the theoretical price of the Dow Jones STOXX 50® September Futures contract on May 2, on the basis of the following market data:*

Futures remaining lifetime (T-t)	141 days
Underlying instrument (C_t)	3,193
Short-term refinancing rate (r_c; actual/360)	2.95 %
Anticipated dividend payments during the futures remaining lifetime in points $d_{t,T}$	36.4**
Time of valuation (value date)	May 2

Please calculate the theoretical price of the DAX® September contract on May 2 on the basis of the following market data: What must be taken into consideration with regard to anticipated dividends?

Futures remaining lifetime (T-t)	141 days
Underlying instrument (C_t)	4,964
Short-term refinancing rate (r_c; actual/360)	2.95 %
Anticipated dividend payments during the futures remaining lifetime in points $d_{t,T}$	54.3
Time of valuation (value date)	May 2

* For the purpose of simplification, the dividend payments are already given in points.
** For the purpose of simplification, we have ignored potential profit from reinvesting dividends.

Long Future

Exercise 155

At the end of December, you expect positive performance from the Eurozone technology sector during the first quarter of the following year. Which of the following futures contracts should you use to benefit from your expectations being met?

Position	Price	Index multiplier
Dow Jones STOXX 50® March (following year)	3,237	EUR 10
Dow Jones EURO STOXX 50® March (following year)	3,375	EUR 10
Dow Jones STOXX® Technology Sector March (following year)	262	EUR 50
Dow Jones EURO STOXX® Technology Sector Futures March (following year)	345	EUR 50

How many futures contracts must you buy to make a profit of approximately EUR 20,000 if the futures climbs by 45 points by mid-March?

Short Future

Exercise 156

In July, you expect prices on the German equity market to fall by year-end. To benefit from the anticipated development, you sell 75 DAX® December Futures contracts on July 9:

Position	Number of contracts	Price
Short DAX® December Futures	75	4,930

Early in September, the DAX® has already fallen significantly and you decide to close out your position on September 5 at a price of 4,520.

Please state the Variation Margin and total profit or loss on the position on the basis of the following market data:

Date	Type of transaction	Buying / selling price	Daily settlement price	Variation Margin debit (EUR)	Variation Margin credit (EUR)
July 9	Sale of 75 DAX® December Futures	4,930	4,942		
July 10			4,975		
July 11			4,945		
July 12			4,897		
...					
September 3			4,545		
September 4			4,567		
September 5	Purchase of 75 DAX® December Futures	4,520	4,510		
Result					

Time Spread

Exercise 157

Please check the correlation between the prices of the DAX® September and December Futures on August 19.

The following market data is available:

Position	Remaining lifetime (T–t)	Price
DAX® September Futures	32	4,568
DAX® December Futures	123	4,594
Short-term refinancing rate (r_t; actual/360)	2.95%	

What spread position must you enter into in order to make a short-term arbitrage profit from an anticipated correction in the mispricing of one of the contracts? Please state the number of spread positions you have to enter into to make a profit of approximately EUR 5,000 on the anticipated market correction.

Short Hedge

Exercise 158

In June, you hold a diversified equity portfolio comprising the following shares:

Share	Quantity	Price on June 18 (EUR)	Beta factor DJ STOXX 50® (250 days)
DaimlerChrysler	2,000	52.54	1.16
Nestlé	500	259.65	0.46
Allianz	600	240.80	1.13
Swiss Re	800	109.01	0.80
Siemens	1,800	66.00	1.47
Hagemayer	80,000	1.61	1.30

Please calculate the beta factor of your portfolio relative to the Dow Jones STOXX 50® Index.

The current level of the Dow Jones STOXX 50® Index is 3,330 points. You expect European equity markets to decline sharply in the coming months. Using Dow Jones STOXX 50® Futures contracts, how can you hedge your portfolio almost entirely, and how many contracts must you trade?

Position	Price	Index multiplier
Dow Jones STOXX 50® September Futures	3,334	EUR 10
Dow Jones STOXX 50® Index	3,330	

Long Hedge

Exercise 159

On July 13, an investor plans to build up a diversified portfolio of Swiss equities to the value of CHF 12,000,000. However, the necessary funds will not be available until early September.

The investor currently considers the Swiss equity market as undervalued and fears prices might rise. Given the following price scenario, how can the investor hedge against rising prices by using SMI® Futures?

July 13	
SMI® September Futures price	6,120
SMI® Index	6,142
Value of the planned portfolio	12,000,000
Beta factor of the planned portfolio	1.06

On September 6, performance of the Swiss equity market was positive, in line with the investor's expectations. Please calculate the outcome for his total position:

September 6	
SMI® September Futures price	6,375
Value of the planned portfolio	12,521,340
Beta factor of the planned portfolio	1.06

Partial Hedge of an Equity Portfolio

Exercise 160

On June 14, you hold a diversified portfolio comprising German blue chips with a total value of EUR 3,540,200. Since you expect considerable uncertainty on the German equity market in the coming weeks, you want to reduce the risk on your position. However, to avoid relinquishing your profit potential in full, you decide to hedge 40 percent of your portfolio using equity index futures. Which of the following futures contracts do you use, and how many contracts do you have to trade to achieve the desired degree of hedge?

Position	Index level on June 14 (underlying)	Index multiplier (futures contract)	Portfolio beta vs. the index
Dow Jones STOXX 50® September	3,237	EUR 10	1.20
Dow Jones EURO STOXX 50® September	3,375	EUR 10	1.13
DAX® September	4,950	EUR 25	0.95
Dow Jones EURO STOXX® Technology Sector Futures March (following year)	345	EUR 50	–*

*Not provided, since the beta factor is only appropriate as a sensitivity indicator, if the portfolio shows a high degree of correlation to the index.

Delta

Exercise 161

In mid-September, you hold the following position comprising Lufthansa shares and options:

Position	Price	Quantity	Option delta (points/EUR)	Position delta (EUR/EUR)
Lufthansa	14.05	1,200 shares	1	
Long Lufthansa November 13 Put	0.42	15 contracts	– 0.29	
Short Lufthansa November 15 Call	0.49	25 contracts	– 0.37	
Total	–	–	–	

To manage your position, you want to know the extent to which your position reacts to changes in the price of the Lufthansa share. Please calculate the position delta (EUR/EUR) and state by how much the value of your position changes, if the Lufthansa share rises by EUR 2.50

Gamma

Exercise 162

In mid-September, you hold the following position comprising Lufthansa shares and options:

Position	Price	Quantity	Option delta (points/EUR)	Option gamma (points/EUR)	Position gamma (EUR/EUR)
Lufthansa	14.05	1,200 shares	1	0	
Long Lufthansa November 13 Put	0.42	15 contracts	– 0.29	0.14	
Short Lufthansa November 15 Call	0.49	25 contracts	– 0.37	– 0.19	
Total	–	–	–	–	

To manage your position, you want to know by how many euros the delta of your portfolio changes, given a one unit increase in the Lufthansa share.

Vega

Exercise 163

In mid-September, you hold the following position comprising Lufthansa shares and options:

Position	Price	Quantity	Option vega (points/EUR)	Position vega (EUR/EUR)
Lufthansa	14.05	1,200 shares	0	
Long Lufthansa November 13 Put	0.42	15 contracts	+ 0.0217	
Short Lufthansa November 15 Call	0.49	25 contracts	– 0.0192	
Total	–	–	–	

Please state the position vega in EUR/EUR.

You expect increasing uncertainty in the aviation sector in the coming days and therefore want to know by how many euros your position will change, given a very short-term increase of five percentage points in the volatility of the Lufthansa share.

Omega (Leverage Effect)

Exercise 164

On June 18, Nestlé shares are trading at CHF 361.50. You buy calls in order to benefit from your expectations that the share price will rise in the coming weeks. Please study the option series on Nestlé shares listed below and state which contract provides the greatest leverage effect (omega).

Position	Price (CHF)	Option delta (in points/EUR)	Option omega
Nestlé July 300 Call	62.06	0.99	
Nestlé July 320 Call	42.68	0.93	
Nestlé July 340 Call	24.23	0.78	
Nestlé July 360 Call	9.22	0.54	
Nestlé July 380 Call	1.61	0.30	
Nestlé July 400 Call	0.11	0.13	
Nestlé September 300 Call	64.18	0.93	
Nestlé September 320 Call	46.20	0.84	
Nestlé September 340 Call	29.66	0.71	
Nestlé September 360 Call	15.71	0.55	
Nestlé September 380 Call	6.27	0.39	
Nestlé September 400 Call	1.92	0.25	

Long Call

Exercise 165

On June 19, you expect an upturn in European equity markets. You wish to benefit from this by buying index call options.

The market situation is as follows:

Position	Price
Dow Jones EURO STOXX 50® Index	3,193
Dow Jones EURO STOXX 50® September 3,200 Call	104.70
Dow Jones EURO STOXX 50® September 3,400 Call	38.30

Please complete the following profit/loss table for both option contracts at the end of the lifetime, and state the break-even point for each contract.

Dow Jones EURO STOXX 50® Index level	Option profit/loss (index points)	Profit/loss per option contract (EUR)
3,600		
3,500		
3,400		
3,300		
3,200		
3,100		
3,000		
2,900		
2,800		

Short Call

Exercise 166

On June 21, you expect the share price of Allianz to stagnate or fall slightly in the short term.

The market situation is as follows:

Position	Price
Allianz share	206.84
Allianz July 190 Call	20.23
Allianz July 210 Call	6.90
Allianz July 230 Call	0.50

You want to limit the risk of being exercised. Which of the options listed above do you choose? Please substantiate your choice.

How many contracts must you buy/sell to make a profit of EUR 5,000 at the end of the lifetime, if your forecast is met?

Please complete the following profit/loss table for the option position selected, and state the break-even point.

Allianz share price at the end of the option's lifetime	Option profit/loss (index points)	Profit/loss on options position (EUR)
230		
225		
220		
215		
210		
205		
200		
195		
190		

Long Put

Exercise 167

It is mid-July, you expect share prices in the Eurozone healthcare sector to fall sharply. You want to benefit from the anticipated downtrend, while at the same time limiting the loss should the forecast be inaccurate.

The market situation is as follows:

Position	Price	Delta	Omega (leverage effect)
Dow Jones STOXX® 600 Healthcare Index	377.20	1	1
Dow Jones EURO STOXX® Healthcare Index	410.20	1	1
Dow Jones STOXX® 600 Healthcare September 370 Put	8.30	–0.2186	–9.93
Dow Jones STOXX® 600 Healthcare September 390 Put	12.40	–0.3218	–9.79
Dow Jones EURO STOXX® Healthcare September 400 Put	15.20	–0.3887	–10.49
Dow Jones EURO STOXX® Healthcare September 420 Put	23	–0.5527	–9.86

Please select the position which would enjoy the greatest anticipated growth when prices in the Eurozone healthcare sector fall, giving reasons for your choice. The index multiplier for all contracts listed above is EUR 50.

Please complete the profit/loss table for the option positions selected at the end of the lifetime of the long put, stating the break-even point.

Index level	Option profit/loss (index points)	Profit/loss per option contract (EUR)
450		
440		
430		
420		
410		
400		
390		
380		
370		
360		

Short Put

Exercise 168

On June 20, you expect the price of the UBS share to stagnate or rise slightly during the second half of the year.

The market situation is as follows:

Position	Price
UBS share	75.90
UBS December 90 Put	16.53
UBS December 75 Put	6.05
UBS December 65 Put	2.51

Which position from the options referred to do you choose? Please substantiate your choice. How many contracts must you buy/sell to make a profit of CHF 12,000 at the end of the option's lifetime, if your forecast is met?

Please complete the profit/loss table for the selected position at the end of the lifetime of the short put, stating the break-even point.

UBS share price at the end of the option's lifetime	Option profit/loss (index points)	Profit/loss on options position (CHF)
100		
90		
85		
80		
75		
70		
65		

Bull Call Spread

Exercise 169

At the end of June, you expect the price of Deutsche Post shares to rise slightly in the coming months. You want to build up a position with limited risk, involving lower costs than those that would be incurred for a single (outright) option position.

The market situation is as follows:

Position	Price
Deutsche Post share	13.94
Deutsche Post August 13 Call	1.06
Deutsche Post August 13 Put	0.38
Deutsche Post August 14 Call	0.52
Deutsche Post August 14 Put	0.84
Deutsche Post August 15 Call	0.21
Deutsche Post August 15 Put	1.53

Which position from the options referred to do you choose?

Please complete the following profit/loss table for the position selected at the end of the options' lifetime and state the break-even point.

Deutsche Post share price at the end of the options' lifetime	Option position 1	Option position 2	Overall position
15.50			
15			
14.50			
14			
13.50			
13			
12.50			

How many spreads must you buy to make a profit of approx. EUR 3,500 on an increase in the Deutsche Post share price to EUR 15 at the end of the options' lifetime?

Bull Put Spread

Exercise 170

In June, you expect the Swiss equity market to recover slightly over the coming months. You want to benefit from this recovery, whilst building up a position that does not require a capital investment.

The market situation is as follows:

Position	Price
SMI® Index	6,005.60
SMI® September 5,800 Call	407.70
SMI® September 5,800 Put	145.70
SMI® September 6,000 Call	272.30
SMI® September 6,000 Put	209.60
SMI® September 6,200 Call	167.30
SMI® September 6,200 Put	303.90

Which position from the options referred to do you choose? What is the net premium per spread in CHF?

Please complete the following profit/loss table for the position selected at the end of the options' lifetime and state the break-even point.

SMI® Index level at the end of the options' lifetime	Option position 1	Option position 2	Overall position
6,250			
6,200			
6,150			
6,100			
6,050			
6,000			
5,950			
5,900			

Bear Put Spread

Exercise 171

On June 20, you expect prices on the German equity market to fall slightly. You want to build up a position with limited risk that involves lower costs than those of a single (outright) option position.

The market situation is as follows:

Position	Price
DAX® Index	4,385
DAX® September 4,000 Call	550.00
DAX® September 4,000 Put	95.20
DAX® September 4,400 Call	275.30
DAX® September 4,400 Put	216.80
DAX® September 4,800 Call	102.50
DAX® September 4,800 Put	440.40

Which options do you trade to establish this strategy?

How many spreads can you acquire to limit the maximum loss on the strategy to approx. EUR 5,000? The contract value of the DAX® index options is EUR 5/point.

Please complete the following profit/loss table of the strategy at the end of the options' lifetime and state the break-even point.

DAX® Index level at the end of the options' lifetime	Option position 1	Option position 2	Overall position
5,000			
4,800			
4,600			
4,400			
4,200			
4,000			
3,800			

Bear Call Spread

Exercise 172

In June, you expect the Siemens share price to fall. You want to benefit from this scenario, without however having to invest capital to build up the position.

The market situation is as follows:

Position	Price
Siemens share	61.15
Siemens August 55 Call	8.23
Siemens August 55 Put	1.78
Siemens August 60 Call	4.99
Siemens August 60 Put	3.53
Siemens August 65 Call	2.66
Siemens August 65 Put	6.19

Which position from the options referred to do you choose? What is the net premium per spread in EUR?

Please complete the following profit/loss table for the position selected at the end of the options' lifetime and state the break-even point.

Siemens share price at the end of the options' lifetime	Option position 1	Option position 2	Overall position	Overall position (EUR)
67.50				
65				
62.50				
60				
57.50				
55				
52.50				

Long Straddle

Exercise 173

In June, you analyze the German banking sector, in particular the volatility of Deutsche Bank. You come to the conclusion that the volatility of this share will increase.

The market situation is as follows:

Position	Price	Vega
Deutsche Bank share	68.90	–
Deutsche Bank August 60 Call	10.12	0.07
Deutsche Bank August 60 Put	0.90	0.07
Deutsche Bank August 70 Call	3.29	0.11
Deutsche Bank August 70 Put	4.04	0.11
Deutsche Bank August 80 Call	0.71	0.08
Deutsche Bank August 80 Put	11.41	0.08

Please create a long straddle with options on Deutsche Bank.

If your forecast is not met, you should plan to close out the position if the volatility falls by five percentage points in the short-term. How many long straddles can you enter into if you want to limit the loss in this case to EUR 10,000?

Please complete the following profit/loss table for the strategy at the end of the options' lifetime, and state the break-even points.

Deutsche Bank share price at the end of the options' lifetime	Option position 1	Option position 2	Overall position	Overall position (EUR)
85				
80				
75				
70				
65				
60				
55				

Long Strangle versus Long Straddle

Exercise 174

In mid-June, you expect the volatility of the Credit Suisse Group share price to increase.

The market situation is as follows:

Position	Price	Vega
Credit Suisse share	47.90	–
Credit Suisse August 40 Call	10.12	0.07
Credit Suisse August 40 Put	0.90	0.07
Credit Suisse August 48 Call	3.29	0.11
Credit Suisse August 48 Put	4.04	0.11
Credit Suisse August 55 Call	0.71	0.08
Credit Suisse August 55 Put	11.41	0.08

Please state the two option strategies from which you can benefit when volatility rises. Please complete the following figures for both strategies and describe the differences between them.

Position	Value
Cost per position (CHF)	
Upper break-even point	
Lower break-even point	
Profit on a one percentage point increase in volatility (CHF)	

Short Straddle

Exercise 175

You expect the uncertainty in the telecommunications sector to decrease in the coming months. You therefore expect the volatility of the Dow Jones EURO STOXX® Telecommunications index to fall.

The market situation is as follows:

Position	Price (points)	Vega (points/ percentage points)
Dow Jones EURO STOXX® Telecommunications Index	300.40	–
Dow Jones EURO STOXX® Telecommunications September 280 Call	32.90	0.52
Dow Jones EURO STOXX® Telecommunications September 280 Put	10.90	0.52
Dow Jones EURO STOXX® Telecommunications September 300 Call	21.80	0.59
Dow Jones EURO STOXX® Telecommunications September 300 Put	19.60	0.59
Dow Jones EURO STOXX® Telecommunications September 320 Call	13.70	0.44
Dow Jones EURO STOXX® Telecommunications September 320 Put	31.40	0.44

Please create a short straddle with options on the Dow Jones EURO STOXX® Telecommunications Index.

Calculate the number of short straddles required to achieve a minimum profit of EUR 4,000 should the volatility fall immediately by three percentage points. The contract value of the options is EUR 50/point.

Please complete the following profit/loss table for the strategy at the end of the options' lifetime, and state the break-even points.

Dow Jones EURO STOXX® Telecommunications index level at the end of the options' lifetime	Option position 1	Option position 2	Overall position	Overall position (EUR)
350				
330				
320				
310				
300				
290				
280				
270				
250				

Hedging with Long Puts

Exercise 176

In June, an investor holds 2,500 DaimlerChrysler shares. The investor considers the shares' long-term potential as positive. However, he anticipates considerable uncertainty in the coming weeks. He wants to limit the loss to EUR 10,000 should prices fall. This maximum loss should also include the hedging costs.

The market situation is as follows:

Position	Price	Contract size
DaimlerChrysler share	46.90	–
DaimlerChrysler June 42 Call	5.85	100
DaimlerChrysler June 42 Put	0.63	100
DaimlerChrysler June 44 Call	4.28	100
DaimlerChrysler June 44 Put	1.06	100
DaimlerChrysler June 50 Call	0.71	100
DaimlerChrysler June 50 Put	4.81	100

Which of the options listed above can he use, and how many contracts must be bought or sold to hedge the total position as planned?

Please complete the profit/loss table at the end of the lifetime for the options position selected. What is the maximum loss on the total position per share?

DaimlerChrysler share price at the end of the option's lifetime	Option	Profit/loss on options position (EUR)	Profit/loss per share (EUR)	Total profit/total loss (EUR)
48				
47				
46				
45				
44				
43				
42				
41				
40				

Covered Call Writing

Exercise 177

An investor holds 1,500 Munich Re shares. He does not expect the share price to rise significantly in the coming months.

The market situation is as follows:

Position	Price	Contract size
Munich Re share	221.00	–
Munich Re July 200 Call	28.98	10
Munich Re July 200 Put	7.50	10
Munich Re July 220 Call	16.49	10
Munich Re July 220 Put	14.94	10
Munich Re July 240 Call	9.97	10
Munich Re July 240 Put	26.44	10

If he is prepared to forego profit opportunities should prices rise sharply, which options can the investor use to enhance profit if prices remain stable or mark a slight increase? Please complete the profit/loss table for the selected options position at the end of the lifetime. To what extent is the investor's profit potential limited?

Munich Re share price at the end of the option's lifetime	Option	Profit/loss on options position per contract unit (EUR)	Profit/loss per share (EUR)	Total profit/total loss (EUR)
260				
250				
240				
230				
220				
210				
200				
190				

Please enter the total Additional Margin requirement of the position.

Hedging with Equity Index Options

Exercise 178

In June, you hold a diversified equity portfolio comprising the following shares:

Share	Quantity	Price on June 18 (EUR)	Market value (EUR)	Proportion of the portfolio	Beta factor DJ STOXX 50® (250 days)
DaimlerChrysler	2,000	52.54	105,080	0.1471	1.16
Nestlé	500	259.65	129,825	0.1818	0.46
Allianz	600	240.80	144,480	0.2023	1.13
Swiss Re	800	109.01	87,208	0.1221	0.80
Siemens	1,800	66.00	118,800	0.1663	1.47
Hagemayer	80,000	1.61	128,800	0.1803	1.30
Total			**714,193**		

The portfolio's beta factor relative to the Dow Jones STOXX 50® Index is 1.0594.*

The Dow Jones STOXX 50® Index is currently trading at 3,330 points. You are concerned the price level may fall in the short-term and want to hedge your portfolio at an index level of 3,000 points. Which, and what quantity of the following contracts can you use to implement this strategy?

Position	Price	Index multiplier
Dow Jones STOXX 50® September Futures	3,334	EUR 10
Dow Jones STOXX 50® August 3,000 Call	366.30	EUR 10
Dow Jones STOXX 50® August 3,000 Put	29.50	EUR 10

* Please refer to the example "Short Hedge" (exercise/solution 158) on how to calculate the beta factor.

Synthetic Long Index Call

Exercise 179

You expect the German equity market to recover significantly in the coming months. You want to benefit from the anticipated rise in the DAX® Index, while entering into a position with limited risk exposure. You therefore decide on a long call.

The market situation is as follows:

Position	Price
DAX® September Futures	4,396.50
DAX® September 4,400 Call	245.60
DAX® September 4,400 Put	244.60

Please complete the profit/loss table for both the synthetic and "real" long call and check which of the two positions has the more favorable profit/loss profile at the end of the lifetime. Please state the price advantage.

DAX® Index level at the end of the option's lifetime	Future	Option	Synthetic long call	"Real" long call
4,800				
4,700				
4,600				
4,500				
4,400				
4,300				
4,200				
4,100				
4,000				

Synthetic Short Index Call

Exercise 180

You expect share prices in TecDAX® to stagnate or to fall in the coming months, and you are prepared to accept the risk of going short. You therefore decide to sell TecDAX® Calls.

The market situation is as follows:

Position	Price
TecDAX® September Futures	652
TecDAX® September 650 Call	55.10
TecDAX® September 650 Put	56.10

Please complete the profit/loss table for both the synthetic and "real" short call and check which of the two positions has the more favorable profit/loss profile at the end of the options' lifetime. Please state the price advantage.

TecDAX® Index level at the end of the options' lifetime	Future	Option	Synthetic short call	"Real" short call
850				
800				
750				
700				
650				
600				
550				
500				

Synthetic Long Index Put

Exercise 181

You expect the Swiss equity market to weaken considerably in the coming months. You want to benefit from the anticipated price collapse in this segment, while entering into a position with limited exposure to risk. You therefore decide on a long put on the SMI® Index.

The market situation is as follows:

Position	Price
SMI® September Futures	5,944
SMI® September 5,950 Call	242.80
SMI® September 5,950 Put	252.90

Please complete the profit/loss table for both the synthetic and "real" long put, and check which of the two positions has the more favorable profit/loss profile at the end of the options' lifetime. Please state the price advantage.

SMI® Index level at the end of the options' lifetime	Future	Option	Synthetic long put	"Real" long put
6,500				
6,400				
6,300				
6,200				
6,100				
6,000				
5,900				
5,800				
5,700				
5,600				
5,500				

Synthetic Short Index Put

Exercise 182

In June, an investor expects prices on European equity markets to stagnate or to rise slightly. He is prepared to accept the risks associated with a short position and decides to sell puts on the Dow Jones STOXX 50® Index.

The market situation is as follows:

Position	Price
Dow Jones STOXX 50® September Futures	3,035
Dow Jones STOXX 50® September 3,000 Call	173.40
Dow Jones STOXX 50® September 3,000 Put	134.10

Please complete the profit/loss table for both the synthetic and "real" short put and check which of the two positions has the more favorable profit/loss profile at the end of the options' lifetime. Please state the price advantage.

Dow Jones EURO STOXX 50® index level at the end of the options' lifetime	Future	Option	Synthetic short put	"Real" short put
3,500				
3,400				
3,300				
3,200				
3,100				
3,000				
2,900				
2,800				
2,700				
2,600				
2,500				

Conversion Strategy

Exercise 183

In mid-June, you are looking at December options on the DAX® Index and notice that the 4,800 Call is overvalued compared with the put with the same lifetime and exercise price. The real DAX® Future therefore has a price advantage over the synthetic contract.

Please create an arbitrage strategy exploiting the existing price imbalance.

The market situation is as follows:

Position	Price
DAX® December Futures	4,439
DAX® December 4,800 Call	178.30
DAX® December 4,800 Put	528.40

Please complete the profit/loss table for both the synthetic and "real" futures, stating the profit per contract in EUR made on the strategy.

DAX® Index level at the end of the options' lifetime	Option position 1	Option position 2	Synthetic short future	"Real" long future	Conversion
5,000					
4,900					
4,800					
4,700					
4,600					
4,500					
4,400					
4,300					
4,200					
4,100					
4,000					

Reversal Strategy

Exercise 184

An investor looking at the December options on the SMI® Index notes that the 6,300 put is overvalued compared with the call with the same lifetime and exercise price. The synthetic SMI® Future therefore has a price advantage over the real contract.

Please create an arbitrage strategy exploiting the existing price imbalance.

The market situation is as follows:

Position	Price
SMI® December Futures	5,944
SMI® December 6,300 Call	174.90
SMI® December 6,300 Put	539.60

Please complete the profit/loss table for both the synthetic and "real" futures, stating the profit per contract in CHF made on the strategy.

SMI® Index level at the end of the options' lifetime	Option position 1	Option position 2	Synthetic short future	"Real" long future	Reversal
6,500					
6,400					
6,300					
6,200					
6,100					
6,000					
5,900					
5,800					
5,700					
5,600					
5,500					

Solutions

Fundamental Terms of Securities Management

Solution 1

One of the most important publications on portfolio theory is the "Portfolio Selection Model" which was developed by H. M. Markowitz.

Solution 2

The statement is true.

Solution 3

The return on a share comprises the price performance, together with all income such as dividends and subscription rights.

Solution 4

The statement is false. The risk is calculated from the positive and negative deviations of the return from the mean of the returns.

Solution 5

A statistical measure of the risk associated with an investment vehicle is the standard deviation or volatility.

Solution 6

The values assumed by the correlation coefficient can range between –1 and +1.

Solution 7

A correlation (correlation coefficient) of –1.

Solution 8

Efficient portfolios have a maximum anticipated return for a given risk or a minimum risk for a given anticipated return.

Solution 9

Systematic risk is the overall market risk. It is reflected by general price fluctuations in the equity market that are attributable (for example) to developments in the economy or political events.

Solution 10

Unsystematic risk represents factors not related to overall market development, i.e. company or sector-specific risk.

Solution 11

The beta factor reflects the sensitivity of the share relative to the market or comparable index. In this context, only systematic risk rather than unsystematic risk is assessed.

Solution 12

The share price movement is equal to that of the overall equity market.

Solution 13

The share price moves to a lesser degree than the overall market.

Solution 14

Diversification is generally regarded as the distribution of the available capital for investment in order to create an efficient portfolio according to portfolio theory.

Solution 15

Unsystematic risk can be minimized through diversification.

Solution 16

One must ensure that there is low correlation between the returns (or performance) of the portfolio's component shares. A risk-reducing effect arises only when the correlation of the shares is less than one. If you are aiming for the highest possible diversification, it makes little sense in practice to combine shares from one or only a few sectors (for example automobiles: BMW, Volkswagen, DaimlerChrysler), since this only minimally reduces the risk.

Solution 17

A correlation or correlation coefficient of +1 does not lead to a reduction in risk.

Solution 18

Non-perfect correlation provides a partial compensation of fluctuations in return, so that the portfolio volatility is lower than the sum of the volatilities of its components.

Characteristics of Derivative Financial Instruments

Solution 19

The principal use of derivative instruments is that they allow for the transfer of risks. Using futures and options, investors can transfer undesired risks to other market participants with the opposite preference for those risks.

Solution 20

The capital invested in derivative instruments is lower relative to the sums involved in a comparable cash market transaction.

Solution 21

Unconditional forward transactions comprise the obligation of both contractual parties to buy or sell a specific underlying instrument, at a price agreed upon today, at a specific date in the future.

Solution 22

Conditional forward transactions comprise the right of the buyer to buy (call option) or to sell (put option) a specific amount of an underlying instrument at a price agreed upon today (the exercise price), on or up to a specific last trading date.

Introduction to Equity Index Futures

Solution 23

The contract specifications of derivatives traded on futures and options markets are standardized. OTC derivatives, on the other hand, are not standardized.

Solution 24

The buyer of an equity index futures contract (holder of a long position) enters into the obligation to receive a set amount of a specific (financial) instrument at a set point in time at a price set in advance. Since physical delivery of an index is generally impossible, settlement is in cash.

Solution 25

A short position is opened by selling a futures contract.

Solution 26

Since the index is an abstract underlying instrument and physical delivery of all underlying securities of an index is not feasible in practice, Eurex equity index futures are settled in cash at maturity.

Solution 27

Offsetting by means of a counter-transaction, thereby relieving the investor of the obligation originally entered into.

Solution 28

The statement is true.

Solution 29

The maturity months June, September, and December are available in May.
The next three contract months within the cycle March, June, September, December are traded at any one point in time.

Solution 30

The current contract value of an SMI® Futures contract is CHF 61,420.

Calculation:

Contract value = Futures price × Index multiplier
= 6,142 points × CHF 10/point
= CHF 61,420

Solution 31

The last trading day is the third Friday of the maturity month. If the third Friday of the maturity month is not a trading day, the last trading day is the trading day immediately preceding the third Friday.

Solution 32

The minimum price change of a futures contract is referred to as a tick.

Solution 33

Eurex Clearing AG is the central counterparty.

Solution 34

To protect itself from a clearing member's default, Eurex Clearing AG requires that margin is pledged for each open long and short futures position.

Solution 35

Additional Margin and Futures Spread Margin for equity index futures contracts serve to cover the maximum losses expected on one exchange trading day.

Solution 36

Opposite long and short positions in the same equity index futures contract with different maturity months are referred to as spread positions.

Solution 37

The high correlation of the components of the spread positions means that Futures Spread Margin rates are lower than those for Additional Margin, which is charged on all non-spread positions.

Solution 38

If the underlying instrument fluctuates, the lower margin relative to the equivalent futures position can result in a strong leverage effect.

Solution 39

A mark-to-market valuation at the end of each trading day determines the effective profit/loss on the futures contracts resulting from the daily market fluctuations. This is subsequently settled through payment of the Variation Margin.

Solution 40

Variation Margin is credited or debited, in cash, on a daily basis.

Solution 41

When entering into a new futures position, the Variation Margin at the end of the trading day is calculated from the difference between the futures daily settlement price and the purchase or selling price of the futures contract.

Solution 42

This statement is true. Variation Margin offsets the given profits and losses between market participants. In contrast, Additional Margin and Futures Spread Margin represent collateral, which protects against potential future (and hence yet unknown) losses.

Solution 43

When underlying prices fall, holding a long position results in the margin account being debited.

Futures Pricing

Solution 44

Price index and performance (total return) index.

Solution 45

Performance indexes (total return indexes) are based on the assumption that all income from dividends and subscription rights is re-invested.

Solution 46

Futures price = Underlying instrument + Funding costs – Dividend payments

Solution 47

The difference between the cash index and the futures price is referred to as the basis. The basis (expressed in index points) is derived from the difference between the cash index and futures price.

Solution 48

The statement is false. The closer it moves towards maturity, the smaller the theoretical basis (basis convergence). The basis is zero at the maturity date, when the futures price is equivalent to the price of the underlying instrument. This is explained by the decreasing funding costs and dividends.

Solution 49

DAX® and TecDAX® are performance (total return) indexes, where the index calculation includes hypothetically reinvested dividends distributed on the respective equity positions.

Solution 50

Yes, that is possible. Simultaneous low funding costs and high dividends can result in negative cost of carry. The futures contract then trades under the cash index. This is probable for example with the SMI® Futures maturing in June, since many Swiss corporations pay dividends from April to June. Furthermore, current supply and demand scenarios can drive the futures price below the cash index.

Equity Index Futures Strategies

Solution 51

A long futures position.

Solution 52

Profit is made on short futures positions when prices fall.

Solution 53

The long futures holder must pay Variation Margin during the lifetime when prices fall. These payments can significantly exceed the margin pledged initially (Additional Margin).

Solution 54

The investor expects prices of the shares comprising the underlying equity index to fall.

Solution 55

The short sale of an equity portfolio is comparable with the risk profile of a short index futures position.

Solution 56

The statement is false. Margin must be pledged by both the buyer and seller of futures.

Solution 57

Date	Daily settlement price (points)	Variation Margin (points)	Index multiplier (EUR/point)	Number of contracts	Variation Margin (EUR)
August 13	3,470	+42	25	30	+31,500
August 14	3,492	–22	25	30	–16,500
August 15	3,440	+52	25	30	+39,000
Total	**–**	**+72**	**25**	**30**	**+54,000**

The investor makes a profit of EUR 54,000.

Solution 58

Additional Margin is only charged for open positions; it is released when a position is closed out. The Additional Margin is reimbursed to the investor after closing out the position.

Solution 59

Simultaneously entering into a long and short position with different maturity months, or contracts (for example long DAX® Futures, short TecDAX® Futures) to exploit relative price changes, is referred to as a spread position.

Solution 60

The theoretical spread at a specific point in time is the difference between the net funding costs for the two remaining lifetimes and does not include the expectations regarding the index performance over these time periods.

Solution 61

The spread of futures based on performance indexes widens slightly when index prices rise.

Solution 62

A short hedge is the correct hedging strategy to protect against falling prices. With the short hedge, you sell equity index futures against an existing equity portfolio.

Solution 63

To calculate the number of futures contracts required, you must know the beta factor of your portfolio.

$$\text{Number of futures} = -1 \times \frac{\text{Market value of the portfolio}}{\text{Index level} \times \text{Contract size}} \times \text{Portfolio beta factor}$$

Solution 64

You can hedge your planned portfolio against rising prices by buying DAX® September Futures contracts (long hedge).

Solution 65

You sell 13 contracts.

Calculation

$$\text{Number of futures} = -0.5 \times \frac{\text{Market value of the portfolio}}{\text{Index level} \times \text{Contract size}} \times \text{Beta factor of the portfolio}$$

$$= -0{,}5 \times \frac{3{,}000{,}000}{5{,}175 \times 25} \times 1.15 = -13.33$$

Since only round-lot futures contracts can be traded, the result is rounded to 13 contracts.

Solution 66

The investor must buy 33 contracts.

Calculation

$$\text{Number of futures} = \frac{\text{Market value of the portfolio}}{\text{Index level} \times \text{Contract size}} \times \text{Portfolio beta factor}$$

$$= \frac{2.000.000}{6.620 \times 10} \times 1.1 = 33.23$$

Since only round-lot futures contracts can be traded, the result is rounded to 33 contracts.

Introduction to Equity and Equity Index Options

Solution 67

The holder of an option can buy or sell the underlying instrument at the exercise price (the strike price).

Solution 68

The instrument on which the option is based is the underlying instrument (or "underlying").

Solution 69

This statement is false. American-style options can be exercised on any exchange trading day before expiration. Options that can only be exercised on their last trading day are referred to as European-style options.

Solution 70

The contract size defines the amount of the underlying instrument on which the option is based.

Solution 71

The holder of a put option has the right to sell the underlying instrument.

Solution 72

Selling options is referred to as a short position.

Solution 73

A long call position can only be closed out by selling a corresponding number of identical calls.

Solution 74

If the put is exercised, the seller of a put is obliged to buy the underlying instrument at an exercise price agreed in advance.

Solution 75

The option premium is EUR 1,100.

5 contracts × 100 shares (contract size) × EUR 2.20 = EUR 1,100

Solution 76

The premium for Eurex stock options and equity index options is paid one exchange trading day after the trading date.

Solution 77

When the premium is paid, the option buyer is not subject to any further risk. He has acquired the right to exercise, but has no obligation. Hence, there is no margin requirement.

Solution 78

Premium Margin and Additional Margin. The option seller enters into an obligation to deliver (short call) or take delivery of (short put) the underlying instrument. He must therefore pledge margin, which covers the anticipated costs of closing out the position in the event of unfavorable market development.

Solution 79

If the option seller is forced to close out his position, the potential loss is covered by the Premium Margin. Premium Margin is adjusted daily in line with the new option prices.

Solution 80

Additional Margin serves to hedge against the maximum anticipated loss that might be incurred on the following exchange trading day.

Solution 81

Covered positions, where the seller of a call pledges the underlying instrument as collateral, represent the only exception in the case of stock options.

Options Pricing

Solution 82

The option price comprises the sum of the intrinsic value and the option's time value.

Solution 83

A put has an intrinsic value if the difference between the exercise price and the price of the underlying instrument is greater than zero. Otherwise, the intrinsic value equals zero.

Solution 84

The intrinsic value of a call with an exercise price of EUR 50 is EUR 11 if the price of the underlying instrument is EUR 61.

Solution 85

Market participants' expectations impact on the time value. This reflects the buyer's chances of his forecasts on the development of the underlying instrument during the remaining lifetime being met. The buyer is prepared to pay a certain sum – the time value – for this opportunity. Conversely, the time value represents the compensation the seller receives for the exposure to risk.

Solution 86

The statement is false. The closer an option moves towards expiration, the lower the time value becomes until it eventually reaches zero on the expiration date. Time value decay accelerates with the passing of time, and is highest at the end of the option's lifetime.

Solution 87

Volatility is the annualized standard deviation of the daily returns on the underlying instrument.

Solution 88

Historical volatility is based on historical data and represents the annualized standard deviation of the daily returns on the underlying instrument.

Solution 89

Time acts in the option seller's favor. As the time value equals zero on the expiration date, time acts against the option buyer and in favor of the option seller.

Solution 90

No. The option buyer is not entitled to dividend payments on an option's underlying instrument that are paid during the lifetime of the option.

Solution 91

A high dividend tends to reduce the price of a call. The exact opposite effect applies to a put.

Solution 92

Rising interest rates increase the value of a call.

Solution 93

The price of the call is higher,	**The price of the call is lower,**
the higher the price of the underlying instrument,	the lower the price of the underlying instrument,
the lower the exercise price,	the higher the exercise price,
the longer the remaining lifetime,	the shorter the remaining lifetime,
the higher the volatility,	the lower the volatility,
the higher the interest rate,	the lower the interest rate,
the lower the dividend.	the higher the dividend.

The price of the put is higher,	**The price of the put is lower,**
the lower the price of the underlying instrument,	the higher the price of the underlying instrument,
the higher the exercise price,	the lower the exercise price,
the longer the remaining lifetime,	the shorter the remaining lifetime,*
the higher the volatility,	the lower the volatility,
the lower the interest rate,	the higher the interest rate,
the higher the dividend.	the lower the dividend.

* Some exceptions to this rule can apply to deep in-the-money European-style puts.

Important Risk Parameters – "Greeks"

Solution 94

The option delta factor describes the unit change in the option price, given a one unit change in the share price or index level.

Solution 95

The long call delta lies between 0 and +1.

Solution 96

The long put delta lies between –1 and 0.

Solution 97

The Siemens option is now valued at EUR 11.30.

Initial call value + (Increase in the Siemens share price × Delta)
= EUR 10 + (EUR 2 × 0.65)
= EUR 11.30

Solution 98

The at-the-money long call delta is 0.50.

Solution 99

The at-the-money long put delta is –0.50.

Solution 100

The gamma factor reflects the change in the delta given a one unit change in the underlying share price or index level.

Solution 101

The gamma is at its highest level for at-the-money options immediately before expiration. The gamma factor for long options is always positive.

Solution 102

Yes. The positive gamma increases the delta the further share prices rise. As a result, the option price per unit increase in the share price is greater than for at-the-money options.

Solution 103

The vega measures the influence of volatility of the underlying instrument on the option price. Vega indicates the unit change in the option price given a one percentage point change in the volatility.

Solution 104

The time value decay of an option rises, the closer the expiration date. It is highest for at-the-money options immediately before expiration. Theta describes the influence of the time value decay on the option price. It indicates the unit change in the option price given a one-period reduction in the remaining lifetime.

Solution 105

$$\text{Omega} = \frac{\frac{\text{Change in the option price}}{\text{Option price}}}{\frac{\text{Change in the share price}}{\text{Share price}}} = \frac{\text{Share price}}{\text{Option price}} \times \text{Delta factor}$$

Omega is calculated from the relationship of the share price to the option price, multiplied by the option delta.

Strategies for Stock Options and Equity Index Options

Solution 106

You opt for long BMW calls.

Solution 107

You sell at-the-money Deutsche Bank calls.

Solution 108

You sell in-the-money VW puts.

Solution 109

You buy in-the-money Nokia puts.

Solution 110

Short positions, also known as short call and short put, benefit from falling volatility.

Solution 111

The potential loss is limited to the option premium. The loss corresponds to 100 percent of the capital investment.

Solution 112

You break even when the price of Henkel preferred shares equals the sum of the exercise price and option price: EUR 75 + EUR 2.35 = EUR 77.35.

Solution 113

At a price of no more than EUR 52.50. The short call option is not exercised, and the investor achieves the maximum profit by retaining the full option premium of EUR 2.10.

Solution 114

Given that (in theory) the price of the underlying instrument can rise infinitely, the maximum potential loss incurred on a short call position is unlimited.

Solution 115

A bull call spread comprises the purchase of a call with a lower exercise price and the sale of a call with a higher exercise price. Since a call premium declines in line with the rising exercise price, the net premium is positive. The position is not subject to margin requirements.

Solution 116

The maximum profit at the end of the lifetime is EUR 1.48. This is derived from the difference between the exercise prices, less the net option premium paid:
(EUR 52.50 – EUR 50.00) – (EUR 3.15 – EUR 2.13) = EUR 1.48.

Solution 117

Profit at the end of the lifetime is EUR 1.40.

Value of the long Lufthansa 15.00 Call at the end of the lifetime:	EUR + 1.85
Value of the short Lufthansa 17.00 Call at the end of the lifetime:	EUR 0.00
Premium paid for the long Lufthansa 15.00 Call:	EUR – 0.81
Premium received for the short Lufthansa 17.00 Call:	EUR + 0.36

Solution 118

A bull put spread comprises the purchase of a put with a lower exercise price and the simultaneous sale of a put with a higher exercise price. Since the put premium increases in line with the rising exercise price, the investor receives a net premium.

Solution 119

Margin must be pledged for a bull put spread, since if the share price falls below the break-even point of the short put, there is a risk of incurring a loss that is not covered by the profit made on the long put.

Solution 120

Delta is positive. The sold put with the higher exercise price has a higher positive position delta than the negative position delta of the bought put with the lower exercise price.

Solution 121

The bear call spread comprises buying a call with a higher exercise price and the simultaneous sale of a call with a lower exercise price.

Sell 3,000 call at 167.40 – Buy 3,100 call at 115.20
= 52,20 × EUR 10 = EUR 522.10

You receive a premium of EUR 522.00.

The bear put spread comprises the simultaneous purchase of a put with a higher exercise price and the sale of a put with a lower exercise price.

Sell 3,000 put at 129.90 – Buy 3,100 put at 177
= – 47.10 × EUR 10 = EUR – 471

You pay a premium of EUR 471.00.

Solution 122

Formula for calculating the maximum profit:

(Long put exercise price – Short put exercise price – Net premium) × Index multiplier
= (3,100 points – 3,000 points = 47.10 points) × EUR 10/point
= 52.90 points × EUR 10/point
= EUR 529

The maximum profit of EUR 529 is made if the Dow Jones EURO STOXX 50® Index falls to or below 3,000 points.

Solution 123

A long straddle is the simultaneous purchase of a call and a put with the same exercise price and expiration date.

Solution 124

Irrespective of the price performance, the investor expects the implied volatility of the purchased option to increase.

Solution 125

No margin is required. The long straddle comprises exclusively long options. The maximum loss is therefore limited to the premium paid.

Solution 126

The seller of a straddle expects the implied volatility of the sold options to decrease.

Solution 127

The maximum theoretical loss on a short straddle is unlimited, since one of its components is a short call.

Solution 128

A long strangle is the simultaneous purchase of a call and a put with the same expiration date and different exercise prices.

Solution 129

The investor presumes the underlying instrument will remain within a certain price level and that the implied volatility will decrease.

Hedging Strategies Using Stock Options and Equity Index Options

Solution 130

VW puts are bought to hedge the total risk. In contrast, market risk (systematic risk) of diversified portfolios can be hedged with equity index options.

Solution 131

An additional return can be gained on an equity portfolio by selling covered calls when prices are stable.

Solution 132

The investor expects stable prices.

Solution 133

No, by pledging the shares as collateral, the covered short call is exempt from margin requirements.

Solution 134

A prerequisite for using equity index options to hedge an equity portfolio is a broadly-diversified equity portfolio and hence a strong correlation to the index underlying the option contract.

Solution 135

Correlation and beta must be observed when hedging an equity portfolio with equity index options.

Solution 136

The beta factor measures the magnitude of the price fluctuations of an individual share relative to the index.

Solution 137

The beta factor of an equity portfolio is the weighted mean of the beta factors of the individual shares.

Solution 138

The beta factor is the weighted mean of the beta factors of the individual shares:

$$0.89 \times \frac{114{,}627}{227{,}706} + 1.24 \times \frac{83{,}424}{227{,}706} + 0.87 \times \frac{29{,}655}{227{,}706} = 1.02$$

The beta factor of the equity portfolio is 1.02.

Solution 139

The number of option contracts necessary is determined as follows:

$$\text{Number of contracts} = \frac{\text{Portfolio value}}{\text{Index level} \times \text{Option contract size}} \times \text{Portfolio beta factor}$$

The index multiplier of the option on the Dow Jones EURO STOXX 50® Index is EUR 10.

$$\text{Number of contracts} = \frac{227{,}706}{3{,}120 \times 10} \times 1.02 = 7.30$$

Seven Dow Jones EURO STOXX 50® Index Puts must be bought to hedge the portfolio.

Solution 140

Only round-lot option contracts can be bought. It is therefore usually impossible to avoid a minor degree of under- or over-collateralization. Also, liquidating the hedge before the end of the option's lifetime can be subject to the risk of a change in the volatility.

Solution 141

A synthetic long DAX® Call comprises one long DAX® Futures position and five long DAX® Put options.

Solution 142

A synthetic short SMI® Call comprises a short SMI® Futures position and a short SMI® Put option.

Solution 143

The components of a synthetic long TecDAX® Put are a long TecDAX® Call option and a short TecDAX® Futures position.

Solution 144

The components of a synthetic short Dow Jones STOXX 50® Put are a long Dow Jones STOXX 50® Futures position, and a short Dow Jones STOXX 50® Call option.

Solution 145

Combining a long EURO STOXX 50® Call option and a short EURO STOXX 50® Put option creates a synthetic long EURO STOXX 50® Futures position.

Solution 146

A conversion strategy is created by combining a synthetic short index futures position, using options, and a "real" long index futures contract.

Solution 147

A synthetic short index futures position is created from a short index call option and a long index put option.

Solution 148

A reversal is created by combining a synthetic long index futures position using options, and a "real" short index futures contract.

Solution 149

A synthetic ...	is created by combining		
	Call	Put	Future
Long call	–	long	long
Short call	–	short	short
Long put	long	–	short
Short put	short	–	long
Long future	long	short	–
Short future	short	long	–

Return on a Portfolio

Solution 150

The return on an equity portfolio is derived from adding the individual returns on shares held in the portfolio according to their individual weighting:

Share	Quantity	Price on January 2 (EUR)	Market value on January 2 (EUR)	Price on June 18 (EUR)	Percentage share of portfolio on January 2	Return on the share	Weighted return
DaimlerChrysler	2,000	46.58	93,160	52.54	0.11	12.80%	+1.45%
Nestlé	500	233.71	116,855	259.65	0.14	11.10%	+1.58%
Allianz	600	270.26	162,156	240.80	0.20	–10.90%	–2.15%
Swiss Re	800	111.69	89,352	109.01	0.11	–2.40%	–0.26%
Siemens	1,800	73.42	132,156	66.00	0.16	–10.11%	–1.62%
Hagemayer	80,000	2.87	229,600	1.61	0.28	–43.90%	–12.24%
Total		**–**	**823,279**	**–**	**1.00**	**–**	**–13.25%**

The return on the portfolio is –13.25 %, indicating that it has underperformed the Dow Jones STOXX 50® Index by 5.85 percentage points.

Eurex Equity Index Futures Contract Values

Solution 151

Underlying instrument	Product Code	Index multiplier	Futures price	Contract value
DAX®	FDAX	EUR 25	4,475	EUR 111,875
TecDAX®	FTDX	EUR 10	683	EUR 6,830
SMI®	FSMI	CHF 10	6,161	CHF 61,610
Dow Jones EURO STOXX 50®	FESX	EUR 10	3,193	EUR 31,930

Futures Spread Margin, Additional Margin and Leverage Effect

Solution 152

Calculating Additional Margin:

$$\text{Additional Margin} = \text{Number of contracts} \times \text{Margin parameter (EUR)}$$
$$= 25 \times \text{EUR } 2{,}700 = \text{EUR } 67{,}500$$

Calculating the value of the position comprising 25 Dow Jones STOXX 50® Futures contracts and the leverage effect:

$$\text{Value of the position} = \text{Number of contracts} \times \text{Futures price} \times \text{Index multiplier}$$
$$= 25 \times 3{,}117 \times \text{EUR } 10 = \text{EUR } 779{,}250$$

$$\text{Leverage effect} = \frac{\text{Value of the position}}{\text{Invested capital}} = \frac{779{,}250}{67{,}500} = 11.54$$

The margin to be pledged is EUR 67,500, from which a leverage effect of 11.54 is calculated on the invested capital relative to the value of the position.

Calculating Futures Spread Margin:

$$\text{Spread Margin} = \text{Number of contracts} \times \text{Margin parameter (EUR)}$$
$$= 25 \times 150 = \text{EUR } 3{,}750$$

The Spread Margin to be pledged is EUR 3,750.

Variation Margin

Solution 153

Date	Settlement price	Profit/loss (index points)	Point value (EUR)	Number of contracts	Variation Margin (EUR)
November 25	4,705	−30	25	17	−12,750
November 26	4,742	+37	25	17	+15,725
November 27	4,726	−16	25	17	−6,800
November 28	4,778	+52	25	17	+22,100
Total	**–**	**+43**	**–**		**+18,275**

The total profit on the position is EUR 18,275.

Futures Pricing: Fair Value

Solution 154

Calculating the theoretical price of the Dow Jones STOXX 50® September Future:

Futures price = Underlying instrument + Financing costs – Dividend payments

$$= 3{,}193 + \left(3{,}193 \times 0.0295 \times \frac{141}{360}\right) - 36.4 = 3{,}193.49$$

The theoretical price of the Dow Jones STOXX 50® September Futures contract is 3,193.49 points. The tick value of the Dow Jones STOXX 50® Futures is one index point, so the determined theoretical price cannot be traded.

One must note that when calculating the price of the DAX® Future, the anticipated dividends are not included in the calculation, since the DAX® Index is a performance index.

Calculating the theoretical price of the DAX® September Future:

Futures price = Underlying instrument + Financing costs

$$= 4{,}964 + \left(4{,}964 \times 0.0295 \times \frac{141}{360}\right) = 5{,}021.35$$

The theoretical price of the DAX® September Future is 5,021.35 points.

The tick value of the DAX® Future is 0.5 index points. Hence the determined theoretical futures price of 5,021.35 cannot be traded.

Long Future

Solution 155

To enter into a long position in the Eurozone technology sector, you must buy the Dow Jones EURO STOXX® Technology Sector March Futures of the following year.

Calculating the number of futures contracts:

$$\text{Number of contracts} = \frac{\text{Anticipated profit}}{\text{Price increase in points} \times \text{Index multiplier}}$$

$$= \frac{\text{EUR } 20{,}000}{45 \times \text{EUR } 50} = 8.89$$

Nine contracts must be bought to make a profit of EUR 20,000.

Short Future

Solution 156

The index multiplier of the DAX® Future is EUR 25/point. The individual Variation Margin amounts are calculated according to the following formula:

Variation Margin = Number of contracts × EUR 25 × Index point difference

Calculating the Variation Margin:

Date	Type of transaction	Buying/selling price	Daily settlement price	Variation Margin debit (EUR)	Variation Margin credit (EUR)
June 9	Sale of 75 DAX® December Futures	4,930	4,942		–22,500
June 10			4,975		–61,875
June 11			4,945	+56,250	
June 12			4,897	+90,000	
.....					
September 3			4,545	+660,000	
September 4			4,567		–41,250
September 5	Purchase of 75 DAX® December Futures	4,520	4,510	+88,125	
Result		**– 410**		**+894,375**	**–125,625**

Since the position was closed out on September 5, the Variation Margin calculation on this day is based on the selling price and not on the daily settlement price.

The total profit on the position is EUR 768,750. This equates to the sum of the Variation Margin amounts that are credited or debited on a daily basis.

Alternatively, the DAX® Future (EUR 25) index multiplier can be used to calculate the profit:

–75 contracts × EUR 25/point (index multiplier) × –410 points = EUR 768,750

Time Spread

Solution 157

The difference between the lifetimes of the September and December futures contracts is 91 days. The theoretical price of the December contract relative to the September contract can be denoted as:

$$\text{Futures price}_{Dec} = \text{Futures price}_{Sep} + \text{Financing costs}_{Sep-Dec}$$
$$= 4{,}568 + \left(4{,}568 \times 0.0295 \times \frac{91}{360}\right) = 4{,}602.06$$

The December contract is undervalued by 8.06 (4,602.06 – 4,594) points relative to the September contract. By selling DAX® September-December spreads, you can benefit from a correction where the price of the DAX® December Future will increase more or decrease less than the DAX® September Future.

Calculating the number of spreads:

$$\text{Number of contracts} = \frac{\text{Anticipated profit}}{\text{Mispricing in points} \times \text{Index multiplier}}$$
$$= \frac{\text{EUR } 5{,}000}{8.06 \times \text{EUR } 25} = 24.81$$

25 spreads must be sold to make a profit of EUR 5,000.

Short Hedge

Solution 158

The beta of your portfolio is the weighted mean of the betas of the shares held in the portfolio:*

Share	Quantity	Price on June 18 (EUR)	Market value (EUR)	Share of portfolio	Beta factor DJ STOXX 50® (250 days)
DaimlerChrysler	2,000	52.54	105,080	0.1471	1.16
Nestlé	500	259.65	129,825	0.1818	0.46
Allianz	600	240.80	144,480	0.2023	1.13
Swiss Re	800	109.01	87,208	0.1221	0.80
Siemens	1,800	66.00	118,800	0.1663	1.47
Hagemayer	80,000	1.61	128,800	0.1803	1.30
Total			**714,193**		

* For information on calculating market values, please refer also to the example on the return on a portfolio.

Calculating the portfolio beta:

$$\text{Beta factor} = 0.1471 \times 1.16 + 0.1818 \times 0.46 + 0.2023 \times 1.13 + 0.1221 \times 0.80 + 0.1663 \times 1.47 + 0.1803 \times 1.30 = 1.0594$$

The beta factor of the portfolio is 1.0594.

You can hedge your portfolio by selling Dow Jones STOXX 50® Futures. The number of futures contracts is calculated according to the formula below: Please note that the index level rather than the futures price is used.

$$\text{Number of futures} = -1 \times \frac{\text{Portfolio value}}{\text{Index level} \times \text{Contract size}} \times \text{Portfolio beta factor}$$

$$= -1 \times \frac{714{,}193}{3{,}330 \times 10} \times 1.0594 = -22.72$$

You have to sell 23 Dow Jones STOXX 50® Futures contracts to hedge your portfolio.

Long Hedge

Solution 159

The index multiplier of the SMI® Future is CHF 10/point.

Calculating the number of futures contracts required to hedge the short equity position:

$$\text{Number of futures} = \frac{\text{Portfolio value}}{\text{Index level} \times \text{Contract size}} \times \text{Portfolio beta factor}$$

$$= \frac{12{,}000{,}000}{6{,}142 \times 10} \times 1.06 = 207.10$$

To hedge against price increases, the investor must go long 207 SMI® September Futures.

Effect of the change in the market situation on the SMI® futures position:

Transaction	Calculation	Costs/income (CHF)
Purchase in July	207 × 6,120 × CHF 10	–12,668,400
Sale in September	207 × 6,375 × CHF 10	+13,196,250
Profit		+527,850

Outcome of the investor's overall position:

Profit on the SMI® futures position	CHF +527,850
Additional investment required for the portfolio	CHF –521,340
Difference of total expenditure	CHF +6,510

The investor's total costs in creating the portfolio are reduced by CHF 6,510.

Partial Hedge of an Equity Portfolio

Solution 160

The DAX® Future should be given preference over other contracts to hedge the portfolio, since experience shows that the DAX® will be closest in terms of correlation to a portfolio of German blue chips.

Calculating the number of futures contracts required for a partial hedge:

$$\text{Number of futures} = \frac{-\text{Degree of hedge} \times \text{Portfolio value}}{\text{Index level} \times \text{Contract size}} \times \text{Beta factor}$$

$$= \frac{-0.40 \times 3{,}540{,}200}{4{,}950 \times 25} \times 0.95 = -10.87$$

You have to sell eleven DAX® September Futures contracts to partially hedge your portfolio.

Delta

Solution 161

The contract size of the Lufthansa option is 100 shares.

The position delta of the individual option is:

Number of contracts × Contract size × Option delta:
for example for the long put below: 15 × 100 × – 0.29 = – 435

Calculating the position delta in EUR/EUR:

Position	Price	Quantity	Option delta (points/EUR)	Position delta (EUR/EUR)
Lufthansa	14.05	1,200 shares	1	1,200
Long Lufthansa November 13 Put	0.42	15 contracts	– 0.29	– 435
Short Lufthansa November 15 Call	0.49	25 contracts	– 0.37	– 925
Total	**–**	**–**	**–**	– 160

Calculating the change in the position:

$$\text{Change in the position value} = \text{Position delta}_{\text{EUR/EUR}} \times \text{Price change}_{\text{in the Lufthansa share}}$$
$$= -160 \times 2.50 = \text{EUR} -400$$

If the Lufthansa share rises by EUR 2.50 to EUR 16.55, your position loses an estimated EUR 400 in value.

Gamma

Solution 162

Calculating the position gamma in EUR/EUR:

Position	Price	Quantity	Option delta (points/EUR)	Option gamma (points/EUR)	Position gamma (EUR/EUR)
Lufthansa	14.05	1,200 shares	1	0	0
Long Lufthansa November 13 Put	0.42	15 contracts	– 0.29	0.14	+ 210
Short Lufthansa November 15 Call	0.49	25 contracts	– 0.37	– 0.19	– 475
Total	**–**	**–**	**–**	**–**	**– 265**

The portfolio delta is reduced by approximately EUR 265 when the share price increases by one unit.

Vega

Solution 163

The position vega of the individual option is:

Number of contracts × Contract size × Option vega:
for example for the long put below: 15 × 100 × 0.00217 = 32.55

Calculating the position vega in EUR/EUR:

Position	Price	Quantity	Option vega (points/EUR)	Position vega (EUR/EUR)
Lufthansa	14.05	1,200 shares	0	0
Long Lufthansa November 13 Put	0.42	15 contracts	+ 0.0217	32.55
Short Lufthansa November 15 Call	0.49	25 contracts	– 0.0192	– 48
Total	**–**	**–**	**–**	**– 15.45**

Given a very short-term increase of five percentage points in the volatility of the Lufthansa share, the value of your position falls by an estimated EUR 77.25 (5 × 15.45).

Omega (Leverage Effect)

Solution 164

The option omega can be calculated from your delta with the help of the following formula:

$$\text{Omega} = \frac{\text{Share price}}{\text{Option price}} \times \text{Delta factor}$$

Calculating the omega:

Position	Price (CHF)	Option delta (in points/EUR)	Option omega
Nestlé July 300 Call	62.06	0.99	5.77
Nestlé July 320 Call	42.68	0.93	7.88
Nestlé July 340 Call	24.23	0.78	11.64
Nestlé July 360 Call	9.22	0.54	21.17
Nestlé July 380 Call	1.61	0.30	67.36
Nestlé July 400 call	0.11	0.13	427.23
Nestlé September 300 Call	64.18	0.93	5.24
Nestlé September 320 Call	46.20	0.84	6.57
Nestlé September 340 Call	29.66	0.71	8.65
Nestlé September 360 Call	15.71	0.55	12.66
Nestlé September 380 Call	6.27	0.39	22.49
Nestlé September 400 Call	1.92	0.25	47.07

The Nestlé July 400 Call with an omega of 427.23 offers the greatest leverage. The leverage effect is greater, the shorter the remaining lifetime and the further the contract is out-of-the-money.

Long Call

Solution 165

Calculating the profit/loss potential of the Dow Jones EURO STOXX 50® September 3,200 Call:

Dow Jones EURO STOXX 50® Index level	Option profit/loss (index points)	Profit/loss per option contract (EUR)
3,600	+295.30	+2,953
3,500	+195.30	+1,953
3,400	+95.30	+953
3,300	−4.70	−47
3,200	−104.70	−1,047
3,100	−104.70	−1,047
3,000	−104.70	−1,047
2,900	−104.70	−1,047
2,800	−104.70	−1,047

The option's break-even point is 3,304.70 points.

Calculating the profit/loss potential of the Dow Jones EURO STOXX 50® September 3,400 Call:

Dow Jones EURO STOXX 50® Index level	Option profit/loss (index points)	Profit/loss per option contract (EUR)
3,600	+161.70	+1,617
3,500	+61.70	+617
3,400	−38.30	−383
3,300	−38.30	−383
3,200	−38.30	−383
3,100	−38.30	−383
3,000	−38.30	−383
2,900	−38.30	−383
2,800	−38.30	−383

The option's break-even point is 3,438.30 points.

Short Call

Solution 166

You decide to sell (at-the-money) July 210 calls. With the at-the-money call, you are selling the highest time value. By selling the (out-of-the-money) 230 calls, the threat of being exercised is lower. However, you are selling less time value and therefore receive less premium. The in-the-money 190 call is not in line with your market expectation.

Calculating the number of contracts:

$$\text{Number of contracts} = \frac{\text{Planned profit}}{\text{Option premium} \times \text{Contract size}}$$

$$= \frac{5{,}000}{6.90 \times 10} = 72.46$$

You have to sell 72 contracts to make a profit of EUR 5,000 if your expectations are met.

Profit/loss table of the position:

Allianz share price at the end of the option's lifetime	Option profit/loss (index points)	Profit/loss on options position (EUR)
230	−13.10	−9,432
225	−8.10	−5,832
220	−3.10	−2,232
215	+1.90	+1,368
210	+6.90	+4,968
205	+6.90	+4,968
200	+6.90	+4,968
195	+6.90	+4,968
190	+6.90	+4,968

The option's break-even point is 216.90 points.

Long Put

Solution 167

You decide to buy out-of-the-money Dow Jones EURO STOXX® Healthcare September puts with an exercise price of 400. Since your expectations are focused within the Eurozone, you should use options on the Dow Jones EURO STOXX® Healthcare Index. The September put with an exercise price of 400 offers the greatest increase in the option premium when prices fall. Although the option has the lower delta, it offers the greatest leverage effect, if one compares the delta with the capital invested. Since the difference in the omega is only minimal in this example, you should also take the liquidity of the individual contracts into consideration when taking your decision.

Dow Jones EURO STOXX® Healthcare index level	Option profit/loss (index points)	Profit/loss per option contract (EUR)
450	–15.20	–760
440	–15.20	–760
430	–15.20	–760
420	–15.20	–760
410	–15.20	–760
400	–15.20	–760
390	–5.20	–260
380	+4.80	+240
370	+14.80	+740
360	+24.80	+1,240

The break-even point of the Dow Jones EURO STOXX® Healthcare Index September 400 Long Put is 384.80 points.

Short Put

Solution 168

You decide to sell (at-the-money) December 75 puts.

With at-the-money puts, you are selling the highest time value. However, the risk of being exercised at the end of the option's lifetime is higher. Selling the out-of-the-money put reduces the threat of being exercised. However, you are selling less time value and hence reducing the maximum profit on the strategy. The in-the-money put does not meet your market expectation.

Calculating the number of contracts (contract size of the UBS option is 100 shares).

$$\text{Number of contracts} = \frac{\text{Planned profit}}{\text{Option premium} \times \text{Contract size}}$$

$$= \frac{12{,}000}{6.05 \times 100} = 19.83$$

You have to sell 20 contracts to make a profit of CHF 12,000 if your expectations are met.

Profit/loss table of the position:

UBS share price at the end of the option's lifetime	Option profit/loss (index points)	Profit/loss on options position (CHF)
100	+6.05	+12,100
90	+6.05	+12,100
85	+6.05	+12,100
80	+6.05	+12,100
75	+6.05	+12,100
70	+1.05	+2,100
65	−3.95	−7,900

The break-even point of the UBS December 75 Short Put is CHF 68.95.

Bull Call Spread

Solution 169

You decide to buy (at-the-money) Deutsche Post August 14 Calls and sell (out-of-the-money) Deutsche Post August 15 Calls.

Profit/loss table of the position:

Deutsche Post share price at the end of the options' lifetime	Long call 14	Short call 15	Overall position
15.50	+0.98	–0.29	+0.69
15	+0.48	+0.21	+0.69
14.50	–0.02	+0.21	+0.19
14	–0.52	+0.21	–0.31
13.50	–0.52	+0.21	–0.31
13	–0.52	+0.21	–0.31
12.50	–0.52	+0.21	–0.31

The break-even point of the bull call spread on Deutsche Post is EUR 14.31 (Lower exercise price + Net premium).

Calculating the number of spreads:

$$\text{Number of spreads} = \frac{\text{Planned profit}}{\text{Profit on the position} \times \text{Contract size}}$$

$$= \frac{3{,}500}{0.69 \times 100} = 50.72$$

You have to sell 51 contracts to make a profit of EUR 3,500 if your expectations are met.

Bull Put Spread

Solution 170

You decide to buy (at-the-money) SMI® September 6,000 Puts and sell (in-the-money) SMI® September 6,200 Puts.

You receive a net premium of CHF 943 (94.30 point difference × CHF 10/point) per spread.

Profit/loss table of the position:

SMI® Index level at the end of the options' lifetime	Long put 6,000	Short put 6,200	Overall position
6,250	–209.60	+303.90	+94.30
6,200	–209.60	+303.90	+94.30
6,150	–209.60	+253.90	+44.30
6,100	–209.60	+203.90	–5.70
6,050	–209.60	+153.90	–55.70
6,000	–209.60	+103.90	–105.70
5,950	–159.60	+53.90	–105.70
5,900	–109.60	+3.90	–105.70

The break-even point of the bull put spread on the SMI® Index is 6,105.70 points (Upper exercise price – Net premium).

Bear Put Spread

Solution 171

You decide to buy (at-the-money) DAX® September 4,400 Puts and sell (out-of-the-money) DAX® September 4,000 Puts. The maximum loss per spread is the net premium; this arises if both options expire worthless.

DAX® Index level at the end of the options' lifetime	Short put 4,000	Long put 4,400	Overall position
5,000	+95.20	−216.80	−121.60
4,800	+95.20	−216.80	−121.60
4,600	+95.20	−216.80	−121.60
4,400	+95.20	−216.80	−121.60
4,200	+95.20	−16.80	+78.40
4,000	+95.20	+183.20	+278.40
3,800	−104.80	+383.20	+278.40

The break-even point of the bear put spread on the DAX® Index is 4,278.40 points (upper exercise price – net premium).

Calculating the number of spreads:

$$\text{Number of spreads} = \frac{\text{Maximum loss}}{\text{Net premium} \times \text{Contract value}}$$

$$= \frac{\text{EUR } 5{,}000}{121.60 \text{ points} \times \text{EUR } 5} = 8.22$$

To limit the potential loss to EUR 5,000, you can only buy a maximum of eight spreads.

Bear Call Spread

Solution 172

You decide to buy (at-the-money) Siemens August 60 Calls and sell (in-the-money) Siemens August 55 Calls.

You receive a net premium of EUR 324 (price difference × 100 shares) per spread.

Profit/loss table of the position:

Siemens share price at the end of the options' lifetime	Long call 60	Short call 55	Overall position	Overall position (EUR)
67.50	+2.51	−4.27	−1.76	−176
65	+0.01	−1.77	−1.76	−176
62.50	−2.49	+0.73	−1.76	−176
60	−4.99	+3.23	−1.76	−176
57.50	−4.99	+5.73	+0.74	+74
55	−4.99	+8.23	+3.24	+324
52.50	−4.99	+8.23	+3.24	+324

The break-even point of the Siemens bear call spread is EUR 58.24 (Lower exercise price + Net premium).

Long Straddle

Solution 173

To implement the strategy, you buy 91 (at-the-money) Deutsche Bank August 70 Calls and 91 (at-the-money) Deutsche Bank August 70 Puts.

An immediate five percentage point reduction in the volatility results in a loss of 0.55 points each (5 percentage points × 0.11 vega) on both options. The total loss is therefore EUR 110 per straddle – the total loss on the 91 straddles is EUR 10,010.

Deutsche Bank share price at the end of the options' lifetime	Long call 70	Long put 70	Overall position	Overall position (EUR)
85	+11.71	–4.04	+7.67	+69,797
80	+6.71	–4.04	+2.67	+24,297
75	+1.71	–4.04	–2.33	–21,203
70	–3.29	–4.04	–7.33	–66,703
65	–3.29	+0.96	–2.33	–21,203
60	–3.29	+5.96	+2.67	+24,297
55	–3.29	+10.96	+7.67	+69,797

The break-even points of the long straddle are at EUR 77.33 (Exercise price + Total premium) or EUR 62.67 (Exercise price – Total premium).

Long Strangle versus Long Straddle

Solution 174

You can benefit from rising volatility by creating an at-the-money long straddle or a long strangle.

The long straddle comprises buying an equal amount of at-the-money calls and puts (Credit Suisse August 48 Calls and Credit Suisse August 48 Puts).

The long strangle usually comprises buying an equal amount of out-of-the-money calls and puts (Credit Suisse August 55 Calls and Credit Suisse August 40 Puts).

Calculating the indicators for the long straddle:

The upper break-even point is derived from the sum of the exercise price and total premium, and the lower break-even point from the difference between the exercise price and total premium.

Position	Value
Cost per straddle (CHF)	733
Upper break-even point	55.33
Lower break-even point	40.67
Profit on a one percentage point increase in volatility (CHF)	22

Calculating the indicators for the long strangle:

The upper break-even point is derived from the sum of the upper exercise price and total premium, and the lower break-even point from the difference between the lower exercise price and total premium.

Position	Value
Cost per straddle	161
Upper break-even point	56.61
Lower break-even point	38.39
Profit on a one percentage point increase in volatility (CHF)	15

Both strategies are ideal to benefit from rising volatility.
In the event of an immediate rise in volatility, the profit potential is 7.00 CHF/contract higher for the long straddle than for the long strangle.

Short Straddle

Solution 175

To implement the strategy, you sell 23 (at-the-money) Dow Jones EURO STOXX® Telecommunications September 300 Calls and 23 (at-the-money) Dow Jones EURO STOXX® Telecommunications September 300 Puts.

An immediate three percentage point reduction in the volatility leads to a profit of 1.77 points each (3 percentage points × 0.59 vega) on both options. Total profit is therefore EUR 177 per straddle (EUR 1.77 × 2 × EUR 50 contract value). To make a minimum profit of EUR 4,000 you have to sell at least 23 straddles (EUR 4,000/EUR 177 = 22.60).

Dow Jones EURO STOXX® Telecommunications Index level at the end of the options' lifetime	Short call 300	Short put 300	Overall position	Overall position (EUR)
350	−28.20	+19.60	−8.60	−9,890.00
330	−8.20	+19.60	+11.40	+13,110.00
320	+1.80	+19.60	+21.40	+24,610.00
310	+11.80	+19.60	+31.40	+36,110.00
300	+21.80	+19.60	+41.40	+47,610.00
290	+21.80	+9.60	+31.40	+36,110.00
280	+21.80	−0.40	+21.40	+24,610.00
270	+21.80	−10.40	+11.40	+13,110.00
250	+21.80	−30.40	−8.60	−9,890.00

The break-even points of the short straddle are 341.40 (exercise price + total premium) and 258.60 (exercise price – total premium).

Hedging with Long Puts

Solution 176

The investor buys 25 DaimlerChrysler July 44 Puts at a price of EUR 1.06 to hedge the position. The costs of this hedge amount to EUR 2,650.

Calculating the number of contracts:

$$\text{Number of contracts} = \frac{\text{Number of shares in the portfolio}}{\text{Contract size}} = \frac{2{,}500}{100} = 25$$

DaimlerChrysler share price at the end of the option's lifetime	Option	Profit/loss on options position (EUR)	Profit/loss per share (EUR)	Total profit/total loss (EUR)
48	−1.06	−2,650	+1.10	+100
47	−1.06	−2,650	+0.10	−2,400
46	−1.06	−2,650	−0.90	−4,900
45	−1.06	−2,650	−1.90	−7,400
44	−1.06	−2,650	−2.90	−9,900
43	−0.06	− 150	−3.90	−9,900
42	+0.94	+2,350	−4.90	−9,900
41	+1.94	+4,850	−5.90	−9,900
40	+2.94	+7,350	−6.90	−9,900

The total loss on the position is limited to EUR 9,900 by the purchase of the puts: Maximum price loss ((46.90 – 44.00) × 2.500) plus the option premium paid (2.650).

Covered Call Writing

Solution 177

So as to enhance the profit or reduce the loss on his position in the event of stable or slightly stagnating prices, the investor sells 150 Munich Re July 240 Calls.

Munich Re share price at the end of the option's lifetime	Short Call 240	Profit/loss on options position per contract unit (EUR)	Profit/loss per share (EUR)	Total profit/total loss (EUR)
260	–10.03	–15,045	+39	+43,455
250	–0.03	–45	+29	+43,455
240	+9.97	+14,955	+19	+43,455
230	+9.97	+14,955	+9	+28,455
220	+9.97	+14,955	–1	+13,455
210	+9.97	+14,955	–11	–1,545
200	+9.97	+14,955	–21	–16,545
190	+9.97	+14,955	–31	–31,545

By selling the calls, the investor limits his profit on his shares to EUR 19 (exercise price – current share price). Taking the option premium received into consideration the overall profit per share is limited to EUR 28.97.

A covered short call is not subject to margin requirements if the underlying instrument is pledged as collateral.

Solution 178

To hedge your portfolio at an index level of 3,000 points, you must buy Dow Jones STOXX 50® August 3,000 Puts.

Calculating the number of contracts:

$$\text{Number of contracts} = \frac{\text{Portfolio value}}{\text{Index level} \times \text{Contract size}} \times \text{Portfolio beta factor}$$

$$= \frac{714{,}193}{3{,}330 \times 10} \times 1.0594 = 22{,}72$$

To hedge your position, you must buy 23 Dow Jones STOXX® August 3,000 Puts.

Synthetic Long Index Call

Solution 179

DAX® Index level at the end of the options' lifetime	Long future	Long put 4,400	Synthetic long call 4,400	"Real" long call 4,400
4,800	+403.50	–244.60	+158.90	+154.40
4,700	+303.50	–244.60	+58.90	+54.40
4,600	+203.50	–244.60	–41.10	–45.60
4,500	+103.50	–244.60	–141.10	–145.60
4,400	+3.50	–244.60	–241.10	–245.60
4,300	–96.50	–144.60	–241.10	–245.60
4,200	–196.50	–44.60	–241.10	–245.60
4,100	–296.50	+55.40	–241.10	–245.60
4,000	–396.50	+155.40	–241.10	–245.60

The synthetic long call has a 4.50 point advantage over the "real" long call at the end of the options' lifetime.

Synthetic Short Index Call

Solution 180

TecDAX® Index level at the end of the options' lifetime	Short Future	Short put 650	Synthetic short call 650	"Real" short call 650
850	–198	+56.10	–141.90	–144.90
800	–148	+56.10	–91.90	–94.90
750	–98	+56.10	–41.90	–44.90
700	–48	+56.10	+8.10	+5.10
650	+2	+56.10	+58.10	+55.10
600	+52	+6.10	+58.10	+55.10
550	+102	–43.90	+58.10	+55.10
500	+152	–93.90	+58.10	+55.10

The synthetic short call has a 3.0 advantage over the "real" short call at the end of the options' lifetime.

Synthetic Long Index Put

Solution 181

SMI® Index level at the end of the options' lifetime	Short future	Long call 5,950	Synthetic long put 5,950	"Real" long put 5,950
6,500	–556	+307.20	–248.80	–252.90
6,400	–456	+207.20	–248.80	–252.90
6,300	–356	+107.20	–248.80	–252.90
6,200	–256	+7.20	–248.80	–252.90
6,100	–156	–92.80	–248.80	–252.90
6,000	–56	–192.80	–248.80	–252.90
5,900	+44	–242.80	–198.80	–202.90
5,800	+144	–242.80	–98.80	–102.90
5,700	+244	–242.80	+1.20	–2.90
5,600	+344	–242.80	+101.20	+97.10
5,500	+444	–242.80	+201.20	+197.10

The synthetic long put has a 4.10 point advantage over the "real" long put at the end of the options' lifetime.

Synthetic Short Index Put

Solution 182

Dow Jones EURO STOXX 50® Index level at the end of the options' lifetime	Long future	Short call 3,000	Synthetic short put 3,000	"Real" long put 3,000
3,500	+465	−326.60	+138.40	+134.10
3,400	+365	−226.60	+138.40	+134.10
3,300	+265	−126.60	+138.40	+134.10
3,200	+165	−26.60	+138.40	+134.10
3,100	+65	+73.40	+138.40	+134.10
3,000	−35	+173.40	+138.40	+134.10
2,900	−135	+173.40	+38.40	+34.10
2,800	−235	+173.40	−61.60	−65.90
2,700	−335	+173.40	−161.60	−165.90
2,600	−435	+173.40	−261.60	−265.90
2,500	−535	+173.40	−361.60	−365.90

The synthetic short put has a 4.30 point advantage over the "real" short put at the end of the options' lifetime.

Conversion Strategy

Solution 183

The conversion is created by selling a synthetic December futures position (buy 5 December 4,800 puts, sell 5 December 4,800 calls) whilst simultaneously buying one "real" DAX® December Futures contract.

DAX® Index level at the end of the options' lifetime	Long put 4,800	Short call 4,800	Synthetic short future	"Real" long future	Conversion
5,000	−528.40	−21.70	−550.10	+561	+10.90
4,900	−528.40	+78.30	−450.10	+461	+10.90
4,800	−528.40	+178.30	−350.10	+361	+10.90
4,700	−428.40	+178.30	−250.10	+261	+10.90
4,600	−328.40	+178.30	−150.10	+161	+10.90
4,500	−228.40	+178.30	−50.10	+61	+10.90
4,400	−128.40	+178.30	+49.90	−39	+10.90
4,300	−28.40	+178.30	+149.90	−139	+10.90
4,200	+71.60	+178.30	+249.90	−239	+10.90
4,100	+171.60	+178.30	+349.90	−339	+10.90
4,000	+271.60	+178.30	+449.90	−439	+10.90

The profit per conversion is 10.90 points or EUR 272.50 per position: Each position comprises one long DAX® Futures contract, five long puts and five short calls.

Reversal Strategy

Solution 184

The reversal is created by buying a synthetic December futures position (buy a December 6,300 call, sell a December 6,300 put) and simultaneously selling the SMI® December Futures.

SMI® Index level at the end of the options' lifetime	Long call 6,300	Short put 6,300	Synthetic long future	"Real" short future	Reversal
6,500	+25.10	+539.60	+564.70	−556	+8.70
6,400	−74.90	+539.60	+464.70	−456	+8.70
6,300	−174.90	+539.60	+364.70	−356	+8.70
6,200	−174.90	+439.60	+264.70	−256	+8.70
6,100	−174.90	+339.60	+164.70	−156	+8.70
6,000	−174.90	+239.60	+64.70	−56	+8.70
5,900	−174.90	+139.60	−35.30	+44	+8.70
5,800	−174.90	+39.60	−135.30	+144	+8.70
5,700	−174.90	−60.40	−235.30	+244	+8.70
5,600	−174.90	−160.40	−335.30	+344	+8.70
5,500	−174.90	−260.40	−435.30	+444	+8.70

The profit per reversal is 8.70 points or CHF 87/contract.

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Further Information

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On the Eurex website **www.eurexchange.com** a variety of tools and services are available, a selection is given below:

Brokerage Services – Investors can inquire online to find appropriate brokerage services (Documents > Participant Lists > Brokers).
E-News – Register in the MyEurex section to automatically receive information about Eurex and its products by e-mail.
Margin Calculation – Eurex offers the Eurex MarginCalculator (Clearing > Risk & Margining > Eurex MarginCalculator) which allows users to determine margin requirements for all products cleared by Eurex Clearing AG.
Price Information – Look up delayed price information (Market Data > Delayed Quotes) for all Eurex derivatives.

Publications

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