MASTER IN

FINANCE

MASTER'S FINAL WORK

INTERNSHIP REPORT

CASE STUDY: TRADING OPTIONS AT BNP PARIBAS

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Abstract

The following case study serves to give a hands-on view of the daily activity and usual jobs performed on a front office trading desk. It is based on a 6-month internship at BNP Paribas Exchange Traded Solutions desk, in Paris. The case study will give an overview of the desk, supply some essential working materials and additional resources and present four exercise questions based around the tasks and assignments performed by the interns at the trading desk. The aim of this case study is to allow students to put into practice academic knowledge in realistic situations and scenarios.

Keywords: Trading, Arbitrage, Market-making, Derivative Products

Resumo

O presente estudo de caso serve para demonstrar algumas das tarefas e funções desempenhadas no dia-a-dia de uma equipa de operações de bolsa dentro de um banco. A experiência descrita baseia-se num estágio de 6 meses no banco BNP Paribas, nos escritórios de "front office" em Paris. Este trabalho descreve a equipa, apresenta varios materiais essenciais para o trabalho e proporciona quatro perguntas de exercício baseadas nas operaçoes diárias e resolução de problemas sobre as actividades de mercado. O objectivo deste estudo de caso é demonstrar através de exemplos práticos os conhecimentos adquiridos em faculdade integrados num cenário realista da indústria financeira.

Palávras-Chave: Mercados de Bolsa, Arbitragem, Produtos Derivados

Acknowledgements

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List of Abbreviations

BNPP - BNP Paribas

CAC - Cotation Assistée en Continu

CET - Central European Time

DAX - Deutcher Aktienindex

ETS - Exchange Traded Solutions

ECB - European Central Bank

PMI - Purchasing Managers' Indices

Forex - Foreign Exchange Currency

SW2 - StarWarrant 2

ISIN - International Securities Identification Number

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1 Introduction

Before I present the case study, I shall introduce the team with whom I worked with under the Master's in Finance Internship at BNP Paribas (BNPP) Arbitrage and how we divide our operations. The Exchange Traded Solutions (ETS) Trading team is split into two parties: one team focuses only on the German and Switzerland markets and the second team focuses on other European markets. I was stationed at the European team, with Matthieu Dismier as my manager and coordinator, Bertram Besombes and Ronan Bihan as the main traders, Ashley Pickerill as the new trader for Foreign Exchange (Forex) and commodities and Alessandro Maggiore, Amal Elfassihi and Alessandro Arcuri as the three interns with whom I worked with. The most noticeable differences between the two teams are the sizes of their markets and their range of products. As such, on the German team the focus is mainly on volatility products: Warrants (particularly on the DAX30 and its stocks) and many different forms of certificates, from capped bonus to discounts and straddles. On the European side, although we do have a few volatility products (most noticeably warrants on the CAC40 and its stocks) we focus more on Delta 1 products, mostly turbos with varied barriers.

Regarding market hours, our team has a commitment towards clients to provide prices from 08:00AM CET until 22:00PM CET. We achieve this with scheduled shifts between the traders: the first shift being from 07:30 to 15:30 CET and the second from 12:30 to 22:00 CET, with weekly rotations among the traders. In Paris, Euronext markets open at 09:00 CET however, between 08:00 and 09:00 we provide Late-Market Trading. We can quote the indexes during these hours with the use

of the futures, deriving its spot by the basis, and commodities and Forex price constantly; this allows us to be on the market almost 24 hours, offering constant prices to clients. It is during active market hours that we collect relevant data on client flow, liquidity and competitor positions. After markets close regular trading hours and quotation is moved to late-market, we proceed with product restriking, new emissions and adjusting products for any corporate actions for the next day.

Now that I have introduced the team and how tasks are organised, I will present the structure of this case study: Section 2 will give a brief description of the initial situation, presenting the case and the questions, Section 3 will provide some useful materials and suggestions for the resolution of the case questions, Section 4 will present the resolution of each question and Section 5 will conclude the case study.

2 Case Study

You are a new employee/intern at BNP Paribas Arbitrage in Paris, stationed with the ETS Trading team in the European desk. During the first weeks, you have familiarized yourself with the products the desk trades, the IT software needed to perform daily tasks and understand how to monitor the trading flow on the books. You will find below information on what you can find and easily get access to in order to gather basic information on products, tasks and markets, to fulfil the tasks assigned.

Your manager has approached you with some interesting tasks to perform and give a qualitative analysis of. Currently, the sales teams of the different countries are trying to expand the offer to clients to increase the bank's market share, but it is always up to the trading desk to have the final word on what could be commercialized. Moreover, with the Greece debt discussions being fruitless and disappointing PMI (Purchasing Managers' Indices) results in both USA and China, the desk has been facing some difficulties in managing its risk. Given all of this, your manager has proposed the following tasks for you to deliver:

2.1 Question 1

Firstly, let us refresh some important theoretical notions related to the desk's main activity. Introduce the concepts of "market making", arbitrage and hedging.

2.2 Question 2

Product issuance and quotation make up the heart of the desk's main functions and a clear knowledge of the products is essential. Clearly describe all of the products the desk trades under BNP Paribas and calculate its redemption value, if any. You must graphically illustrate each product's pay-off, describe its composition and explain all of its barriers.

2.3 Question 3

Knowing which products to issue on the desk is a key driver in competitiveness and the trading desk works very closely with their sales counterparts on this objective. The sales team from the Netherlands has been in talks with a new client who specialized in Bonus-type products. He likes BNP Paribas' business plan but feels the selection in underliers lacking. As such, the sales team have sent to the trading desk a list of stocks and indexes the costumer would like to see in future products. You have been given the task to analyse the list and provide feedback on the issuance plan. Remember that it will be the trading desk providing daily liquidity to these products; in the end, it is their decision to issue or not.

2.3.1 First Step

Prepare a first draft of the list to deliver to traders so they may decide quickly which stocks to keep and which to drop. Think about what kind of product is being requested (bonus and step-up bonus) as well as what kind of information would truly be useful for the traders to decide whether or not to issue [pick a fixed date of your choice to gather information]. Some of the concepts being tested involve the notion of market liquidity, hedging, historical volatility analysis and arbitrage. Keep the report tight and precise.

2.3.2 Second Step

Suppose the traders have decided to issue on Activision Blizzard, Altice, General Electric, Harley Davidson and Heineken. They have asked you to propose the main parameters to set up the price for the first trading day. Make the proposal on the most significant parameters and calculate the Theoretical, bid and ask prices given the spot at the fixed date (D+1), chosen above.

2.4 Question 4

Companies are constantly active in their activity and every day we are given announcements of stock splits, mergers, acquisitions, special dividends and many more. These types of announcements are called "Corporate Actions" and many have direct influence on the underlying of our quotes products. We've just received word that there is going to be a corporate action on Reed Elsevier NV, in which the company is going to have a name change and a bonus issuance. We currently have Open End Turbos on these products and thus we will have to adjust the prices to conform with the corporate action. You may find all the details and procedures on this corporate action, as well as a basic table for calculations on Section 3. Present a simulation of the price changes for all of our current products. The traders will use these calculations to compare prices with the system to check if the corporate action was processed correctly to avoid sending mispriced products the day after the corporate

action.

3 Teaching Aids and Materials

In this section I shall describe the software programmes used for regular daily tasks. Two of which, the Starwarrant and the ETG Books are essential for the day-to-day activity of the desk and provide us with almost all of the needed information to monitor trading flow. The others are additional tools for performing more specific tasks, such as price adjustments, model research and product parametrization.

3.1 IT Set-up

3.1.1 StarWarrant 2

StarWarrant 2 (SW2) is our price quoting tool. It is thanks to this system that we send products to the market and contribute to the exchange by publishing our price quotes continuously. The system is organized in a dynamic way, operating in tabs and windows that you can add and move in the workspace at leisure. As such, I have provided on Figure A1 an intuitive sketch of my own workspace. On the left-hand side there is a section where we can see the current spot of the underlying of any selected product, the bid and ask as well as the basis (if applicable; used for

indexes and baskets). Below that, a sorting list of products, organized by folders; it is common and useful to organise these by pay-off type. To the right, the main window called "Product View": each line represents a product, much like an excel sheet. Here we can see a long list of diverse parameters by scrolling to the right, such as theoretical value, all the fees applied, all the spreads applied, parity, strike, barrier, capitalization of the strike and it's method, Forex premiums, sales fees, broker fees, mouse tactics, dynamic scripts (for spreads and/or margins), and many others. Glossing over some of these parameters with the mouse gives you a calculation formula (for example, with the theoretical value of most products). Below this window, there is another division where more detailed views can be added, to better see some of the parameters used. Some of the tabs I have added to this section are "Spreads", where upon selecting a product from the "Products View" above, I can see exactly what kind of spread is being applied to that particular product and to which value (bid, ask or both). The "Margins" tab acts the same way but with the fees while the "Product Description" tab displays a mixture of IT-related set-ups (such as where the product is booked in our system) and some Final Terms information (maturity, settlement, etc), which can be quite useful when communicating with the IT teams to troubleshoot problems. The "Product Set-up" tab is where we can see some additional technical parameters, such as the existence and price of floors, pre-open prices and some securities we can apply, like the option to apply negative fees.

The "Contracts" in this section allows us to see each individual leg of a product

and its composition such as maturity, emission date and many price shifts pertaining to the Greeks. This information becomes especially useful for more complex products, such as bonus-type products, where we sometimes gather information on the individual contracts that compose the strategy. Finally, there is also a simulation window: it is possible to send a copy of a product from the "Product View" tab to this window, apply modifications (such as fees, spreads, spot shifts) and simulate the effect in the product's price, without sending these quotes to the market. It is a useful feature for testing modifications before applying them as well as confirming prices from certain registered trades.

With the main tool explained, we move now to our second most important tool, the Books.

3.1.2 ETG Book

The Books are, quite literally, trading books that register every single trade we make during that day. It is rather interesting to see this tool in action for the first time as trades go by very fast. Products are divided by books according to pay-off and country. For example, we have a book for Warrants in Paris, another for Turbos in Italy, another for Constant Leverage products in Sweden, and so on. Books can also be aggregated: for example, we have a global book for all Turbos in all countries, to avoid opening too many books at the same time. I'd like to note that for commodities and Forex, there are separated books, as these markets are

quite specific: only one trader from each desk dedicates himself to watching these markets. Here is how the books are organised: they are split into two windows, with the top having the entire list of underlying and the bottom displaying all of the trades carried out in real time. Let us go into details for these two windows (see Figures A3 and A4).

On the top window, we can find the indexes at the very top, then followed by the traded stocks. Sometimes, composite indexes can be found on the bottom of the list, similar to a few baskets on stocks. To the immediate right of the name of the underlyings are a series of columns, each displaying several statistics, such as the spot and market price variation (all in real time), to the number of trades currently in the book, the trades done during the entire day and, of course, the several Greeks from Black, F. and Scholes, M. (1973), which are constantly refreshed. Delta, Gamma and Vega are some of the more important Greeks we pay attention to, as we must hedge our delta almost completely at the end of each trading day, with Gamma influencing this hedge. Extra measures may be taken, for example with the instability of Greece, to accommodate the hedge between overnight or weekend volatility. For more readings on pricing efficiency for overnight gaps, please refer to Chapter 6 for two thesis papers written by Arcuri, A. (2015) and Buckle, F. (2015), who explore the matter more clearly.

On the bottom window we have the trading flow for the day, as the book registers every single trade we make on every product, including our hedging operations on

delta (hedged with futures or stocks, accordingly) and gamma (hedged with vanilla options). Here, we can check each single trade and its Profit and Loss (P& L) generation, along with the strike, maturity, time of the trade, spot at which it traded, price, parity, etc. At the very top of this flow window there's also the possibility to use several filters to better look at the trades (although, it's much easier to do this using other features of the Books).

From the top window, we can right click any underlying to obtain some extra information to open up explanatory tabs. You can click to show all trades in that underlying, calculate a risk matrix, check positions and obtain information on the next dividends, etc. Finally, the Books are also used for end-of-day operation, such as re-striking for certain products, as well as rolling futures when maturities are near expiry.

3.2 Basic Product Description

Figure A5 depicts a full derivatives map and was produced by the SWISS Structured Products Association. It provides a quick, easy-to-understand layout of the pay-offs of many structured products. All products commercialized by BNP Paribas can be found on this table. Be warned that this is a simple and quick go-to chart and does not provide additional information on how the products are built nor detailed information on all of their barriers. Finally, you may also find a direct link to this

chart in Section 6.

3.3 Product Analysis Template

You may find below the initial list sent by the Sales team from Netherlands, already adapted for quick research; it is advised to use Reuters or Bloomberg formulas to speed up the work. It is important to note that the templates below are merely suggestions and starting-points for research and parametrization of new underlyings. Feel free to adapt as needed:

Name	Existing Bonus in StarWarrant 2?	Bloomberg Code	Ric
Activision Blizzard	N	ATVI UW	ATVI.O
Altice	N	ATC NA	ATCE.AS
Amazon	Y	AMZN UW	AMZN.O
AMX	N	AMX	AMX
Apple	Y	AAPL UW	AAPL.O
CAC40	N	CAC	.FCHI
Down Jones	Y	INDU	.DJI
Ford	N	F UN	F
FTSEMIB	N	FTSEMIB	FTMIB
General Electric	Y	GE UN	GE
Harley Davidson	N	HOG UN	HOG
Heineken	N	HEIA NA	HEIN.AS
IBEX 35	N	IBEX	.IBEX
MacDonalds	N	MDC UN	MDC
Nasdac 100	N	NDX	.NDX
Nasdaq Composite	N	CCMP	.IXIC
Nikkei	N	NKY	.N225
NN Group	N	NN NA	NN.AS
Qualcomm	N	QCOM UW	QCOM.O
Russel 2000	N	RTY	.RUT
S&P 500	Y	SPX	.SPX
TomTom	N	TOM2 NA	TOM2.AS
Unilever	N	UNA NA	Unc.AS
Verizon	N	VZ UN	VZ
Wallmart	N	WMT UN	WMT

Figure 1: Initial Underlying List

Name of Instrument		
RIC	Bonus Step Up	Suggestion
	Size	
	Parity	
	% Spread (NL)	
	Fixed fees	
	Rho Div -shift	
	Spot Var	
	Vol BS <1y/1-2y/>2y	

Hedge Analysis	
Hedge €	
Number of Stocks	
Assumed Delta	
Spread (€ and Parity Adjusted]	
FX Rate	
Parity	
Spot	
Bid/Ask	

Figure 2: Parameter Proposal Template

3.4 Corporate Actions

Please refer to Figure A6 for all the details on the corporate action on Reed Elsevier NV. This is a public notice from the exchanges regarding company decisions on corporate actions. After the publication of these documents, it is confirmed by the regulators that a corporate action is about to take.

4 Case Resolution

Below I present the detailed resolution of each question presented on the case study above.

4.1 Question 1

When talking about the trading activity, the concept of brokerage is usually the most common to think about: one would buy or sell products on the market according to the orders given by the client or portfolio managers. However, for that there must first be a market to go to in the first place: that is market making. To quote:

> *Market makers can be categorized within two central structures: (1) a designated structure under which the market maker has an assigned role and is obligated to perform certain duties including, but not limited to, providing liquidity, filling orders, setting prices, and maintaining price continuity or (2) an open structure under which a market maker is governed only by the rules set forth by the exchange for all traders.*
>
> In Boyd, Naomi E. (2015), p.2

Of course, BNPP falls under (1). Part of its activity includes the daily issuance of its own range of products to the market and then staying actively in the market during trading hours (as well as late-trading hours) to provide a counter-party for the order books. In short, if someone wants to buy a BNPP product, we must sell them that product; if someone wants to sell a BNPP product, we must buy that product back from them. Of course, as market makers, we have the leverage to decide the price at which the products go to the market and we take our profits from the fees and margins we apply to the theoretical values of that product as

compensation for being in the market. It goes without saying that without market makers willing to step into the market and take the risk of being the counter-party to buy/sell orders, there would be no market to speak of.

The risk I speak about is that of a market crash, a disaster of some sorts or a news feed that is capable of dramatically shifting the market. For this, we take our precautionary measures and hedge our position for delta and gamma by buying/selling the underlying of our options. Hedging itself is not perfect and comes with a cost; of course, buying the stock needed to hedge the delta of a position is going to cost money however there could be a situation where the underlying is so illiquid or there simply is no market that the cost of protection becomes a topic of discussion. It is up to the traders to make the correct choice: take the monetary effort to buy the underlying at a very high premium or face the potential losses of an unhedged position. Determining which is more costly to the bank in the first place is not an easy task.

Finally, the concept of arbitrage or even the concept of no-arbitrage. As Varian (1987) mentions, <(...), the no arbitrage condition must rule out "free lunches" - configurations of prices such that an individual can get something for nothing.>. Let us also add to this notion the Value Additivity Theorem, and in financial market theory, we are displayed with a very strong condition for no market arbitrage. However, arbitrage still occurs every day, and most of it stems precisely from the violation of the Value Additivity Theorem and partial violation of the "no free lunch"

concept - partial only because associated costs with brokerage and exchanges are realistic and associated to each market transaction.

One very simple way of observing these violations is simply when the put-call parity rules of the market are disrupted, making it possible to exploit a market deficiency and making an easy profit before the market correct itself. The question now rises: why do we have arbitrage situations on the market? Arbitrage usually stems from sending an incorrect prices and, in a split second, our book registers several trades at said price, before we can update our quote. After the update, the arbitrager sells back the product to us and we receive a loss since arbitrages happen at such speed that it is usually not possible to completely hedge the position. Some of these problems stem from IT inefficiencies: since all of our trades are electronic, there only needs to be a few milliseconds' delay between our system and the exchange for the price sent to be incorrect. As algorithm and automatic trading becomes popular, these risks are carefully monitored and reported by the ETS team. In fact, if prices sent to the market are clearly incorrect, we have the option to formally request a cancellation with the exchange (Euronext and Eurex) in the next 20 minutes after the trade.

Another cause can be found in our volatility pricing model. Despite several studies and many literature, the classic Black, F. and Scholes, M. (1973) pricing model commonly used by the market is not efficient. In truth, each institution actually takes this model (and many others) and adapts it to better model market

pricing by adding a volatility algorithm. To simplify, our current model at the ETS desk adds algorithms to calculate and adapt the curve, smile, volatility ratio and dividends. However, the model has limitations, and these are exploited by a carefully observing investor. In theory, the model adjusts automatically to market movement and uses its algorithms to correctly price warrants, but there is a limit to how much the model moves on its own. When the model is not adjusted, we may send incorrect prices to the market: if an arbitrager spots the volatility of the products is not well adapted, he will buy the product cheap and wait until after we correct the model manually to send back the product and make a profit on volatility remarking.

4.2 Question 2

4.2.1 Warrants

Warrants are the basic, classical vanilla options and not the "warrants" mentioned in literature. As an example,

Usually, when a call option on a stock is exercised, the party with the short position acquires shares that have been issued and sells them to the party (...). The company whose stock underlies the option is not involved in any way. Warrants (...) are call options that work slightly differently. They are written by a company on its

own stock.

In Hull, J. C. (2014), p.197

"Warrant" is simply the commercial name among the trading world, which can lead to much confusion for new-comers. For a quick reference, please refer to the table below explaining the main differences between the Structured Options and the Classical Warrants from literature, as well as the traditional pay-off tables of all positions taken with this product:

S/No	Warrants issued by a company	Structured warrants
1	Issued by company over its own shares.	Issued by financial institutions.
2	Less liquidity.	More liquidity.
3	One direction i.e. call warrant.	Both call and put warrants.
4	Usually one exercise price.	Can be more than one exercise price.
5	Lifespan typically measured in years.	Lifespan of usually 6 – 12 months.
6	New shares issued upon exercise.	No new shares issued upon exercise.

Figure 3: Main differences between Warrants and Structured Options, Source: Ernest, Wikipedia

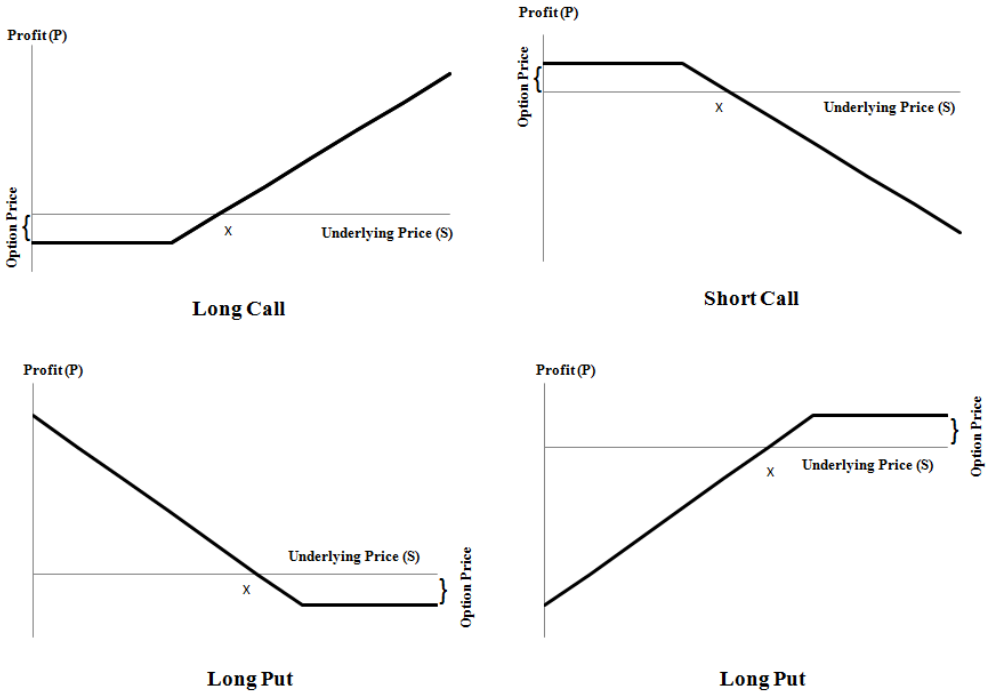

Figure 4: Pay-off of Structured Warrant Options, Source: Ernest, Wikipedia

As seen above, there is not too much to say about this product: the most important specifications are the underlying choice, strike (K), maturity (T) and parity. It is a volatility product and the shift in volatility impacts its price, so much so that it is necessary to be vigilant with our pricing model to make sure it is well-adjusted to market movements. I will not go into much detail into the model itself, but it relied on shifts in curve, smile, interest rate and continuous dividends. The model is dynamic and adjust automatically to the market, but there are exceptions. For example, an illiquid market or maturity, the announcement of dividends that had not been correctly processed in our system, great market moves derived by news announcements, among others. In this case, the model cannot cope with the movements of the market and manual adjustments are needed to correct the price being sent to the market: these have to be quick, as price inefficiencies due to volatil-

ity remarking can be easily exploit nowadays and the bank risks arbitrage. It is quite easy to do this, as an investor who sees inefficiencies is able to buy/sell BNPP products and Eurex/Euronext options of competitors simultaneously to cash-in an immediate profit. Other parameters of this product includes the pay-off at expiration: $(S_T - K)$ for calls and $(K - S_T)$ for puts and the classical call-put parity applies. As for the Greeks, $delta\epsilon[0;1]$ for calls, $delta\epsilon[-1;0]$ for puts, Vega and gamma have positive signs and theta remains negative.

As a final word on volatility, we do not price these options with Monte Carlo but rather with our own internal volatility model simply because of the inefficiencies of Monte Carlo in adapting quickly to unexpected jumps (such is the case with dividend announcements and other corporate actions). Monte Carlo is still used within the bank, but for much more complex structured products, where a basket of options is priced as a whole.

4.2.2 Closed End Turbo

Closed-end turbos, often called simply "turbos", constitute a one-to-one participation on the price move of the underlying with much reduced capital investment. I'd like to point that there we have two types of turbos in our desks: simple turbo and Turbo Pro, which adds an additional activation barrier to the existing stop level barrier (which is always equal to the strike) and this is what lowers the price of the product: for the activation, the products does not technically exist until the under-

lying spot reaches the activation level and if the spot reached the strike level, the product knocks out becoming technically worthless. BNP then re-buys the products for the next 4 days after the event for the price of 0.001 euros. Product specifications involve choice of the underlying, strike (K), maturity and parity while pricing inputs revolve around the strike, dividends, interest rate, exchange rate and buffer (or Gap Risk). The fair value of a Call can be computed as Parity*(St-K)+Gap Risk and the Put as Parity*(-St+K)+Gap Risk. This is a Delta 1 product as such long positions equal a delta of 1 and a negative theta. For hedging proposes, for a Call we hedge with buying $Parity * Position * S_t$ of the underlying, and the Puts we sell by the same amount.

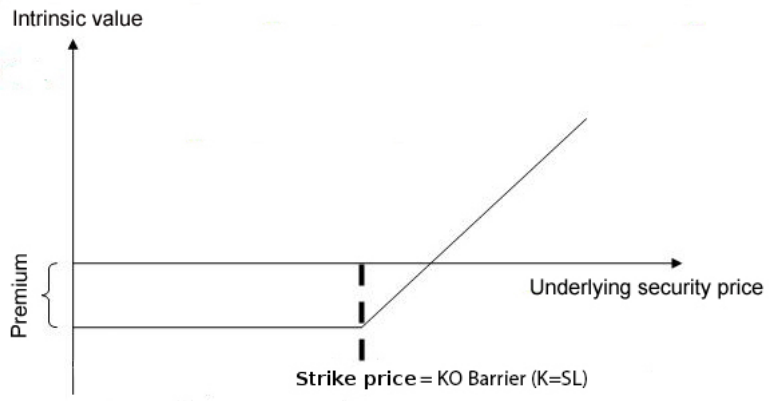

Figure 5: Pay-off of a Closed End Turbo Call Option

As mentioned above, we apply a buffer margin (called Gap Risk) to these products, to help with the barrier management and position unwind. I shall illustrate with a quick example: with these products, the strike and barrier are the same. We will call the "contractual barrier" the value of 4000 for a Turbo Long CAC40 product. In other words, the barrier management takes place at the level of 3990, with the buffer margin at 10. As such, the difference between the strike and the barrier

management is 10 as well. Let us suppose that this product Knocks out (KOs) with the spot at 4000 and we must unwind our position; let us suppose that our delta unwind in this position was 100 futures on the CAC 40 at the price of 4000, so we must now sell 100 futures. This is how we calculate our P& L for the operation: $(100 * 10) * 10 = 10000$. The first multiplication takes into account the quantity needed to unwind and the 10 points buffer margin we have in place, multiplied by the difference between the spot level at which we are able to sell and the barrier (3990). Let's take as a second example in which the market is plummeting and the spot of the CAC40 is going down very rapidly: we will not be able to do the unwind at the stop-loss level. We'll take the same example as before, but change the price of the futures to 3995. The P& L is now calculated as: $(100 * 10) * 5 = 5000$, with the second multiplication the difference between the spot and the barrier level.

The examples above demonstrate two points: the buffer margin acts as a security against spot movements to prevent big losses on our side after the KO event and, since these products are worthless once they KO, the profit upside for us in a KO event can be large depending on our unwind.

4.2.3 Unlimited Turbo

Unlimited turbos are equal to the closed end turbos except on two characteristics: they do not have maturity and while the stop loss is still equal to the strike, the products re-strikes every day, at the end of the trading day. Its specificities are the

same as the closed end turbo, so I will focus in explaining the re-striking process. This type of product needs to be re-striked every day, with the stop loss level closer and closer to the spot of the underlying; in other words, if it's a long position, the strike will increase every day. This makes it more and more likely for the product to knock out the more time passes. Below is a quick illustration of the re-striking process, given that the spot is constant and does not move (for easier illustration):

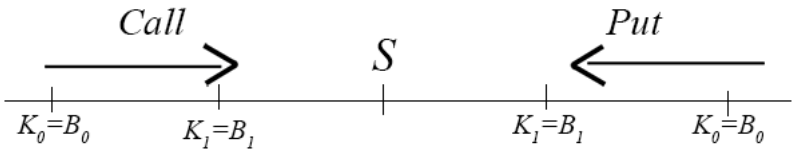

Figure 6: Restriking process with fixed spot

Adding to this the movement of the spot and it is easy to understand where the risk of the product is coming from. For the capitalization of the strike, usually the rate used for these operation is 0.03 in France. As such, here is a quick example of the capitalized strike calculation for 1 month:

$$\left(\left[\frac{30 * 0.03}{365}\right] + 1\right) * K \ = K_{1M} = B_{1M} \tag{1}$$

We've mentioned above the Gap Risk factor (which also applied here), so I will take the opportunity to talk about overnight Gap risk and lack of liquidity. As with the closed end turbo, there is also a risk of unwind when the product knocks out, however, since we re-strike the product at the end of the day, an overnight knock out can actually happen, due to night volatility. It happens from time-to-time that the gap in underlying prices is so big between the close of the last day and the opening of the next day, that after the re-striking process, the stop loss level has actually

already been reached even before the opening of the market. This is a risk the investor needs to take into account: an overnight knock out. However, there is also added risk for the bank, since if the product knocks out overnight and the opening price of the underlying is beyond the gap risk buffer we had in place, the unwind will cost money. There is, of course, the possibility that the price will rebound so it is always up to the trader to determine when to unwind the hedge.

4.2.4 Open End Turbo

Open end turbos (also called Minis) also have no maturity but their biggest distinction regarding the previous products is that the stop loss and the strike are not the same. Namely, SL¿K for Calls and SL¡K for Puts. The Stop loss buffer is usually discussed and arranged with the respective sales team before the product is issued and determines a level of risk for the product, since the difference between the two can be regarded as a Gap Risk measure of sorts. The main difference comes from the fact that, if the product knocks out, the investor is entitled to a residual value depending on the liquidation spot: for a Call, (Liquidation Spot - K) X Parity, for Puts, (K-Liquidation Spot) X Parity. As such, the risk that the hedge cannot be liquidated at stop loss level but rather between stop loss and strike, is deferred to the client. If the hedge is liquidated below K (for Calls), the residual value of the product is 0 and the loss for the bank will be K-SL.

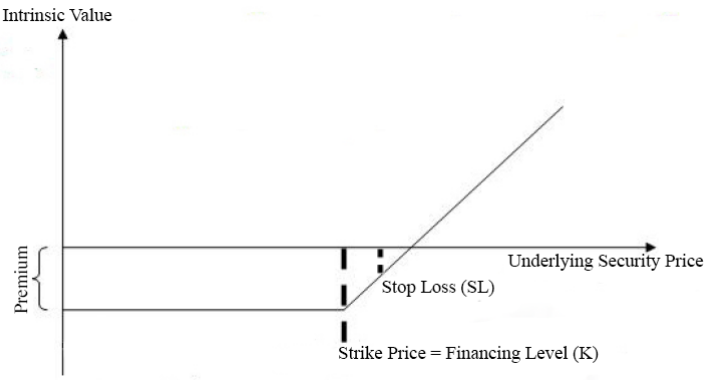

Figure 7: Pay-off of an Open End Call Turbo (Minis)

4.2.5 Certificates: Spreads

The spread are the classical Call Spreads (Bull Spreads) and Put Spreads (Bear Spreads) seen in classical literature. These popular products consist of two legs n which we buy and sell a vanilla call option (in case of call spreads) with different strikes. The resulting combination is a pay-off in which the underlying profits are both capped and floored, making the product cheaper for investors waiting to cash in from a regular call but just before reaching the ceiling. The combination pay-off graph is presented in Figure A2.

Regarding pricing, as this is a product with 2 contracts the specifications are double, except for the underlying choice: strike 1 (K1) and strike 2/ Cap (K2), with K1 ¡ K2, Maturity (T) and Parity. Pricing inputs include K1, K2, T, Volatility Dividends, Interest rate and Exchange rate. The way we compose the product as a whole is done by combining the two legs as Call (K1,T) – Call (K2, T) with the pay-off at expiration date calculated as (St-K1)-(St-K2) although it is rare that this

kind of product is kept until maturity. Regarding the Greeks, as this is a two-legged product, each leg has its own set of Greeks, which is something we must keep in mind: the delta varies between 1 and 0, as usual, while Vega, Gamma and Theta are negative (for calls).

4.2.6 Certificates: Bonus and Bonus Step Up

The Bonus and Bonus Step Up are products with two and three legs respectively. They consist on making a pay-off "step" that acts as a platform for the bonus; in other words, for a certain tight spot window of the underlying, the investor can catch a higher pay-off that with a simple option. As such, the structure of the product consists in a long zero-call and a Closed-End long put: it is this put that makes up the "step" bonus part of the pay-off:

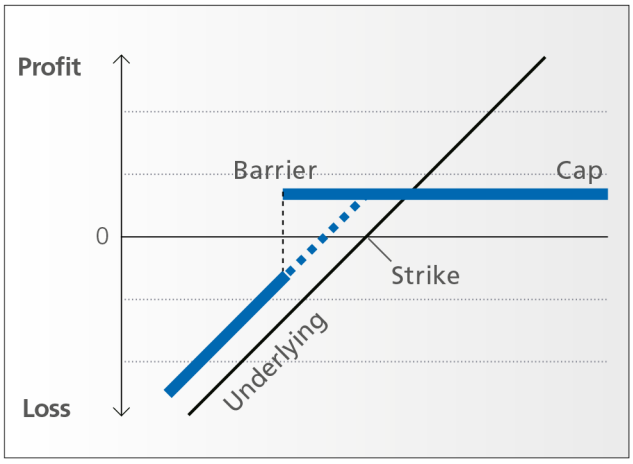

Figure 8: Pay-off of a Bonus, Source: SVSP

The Bonus Step Up adds even more to these gains by incorporating another call

as a third leg. This third leg makes it so that, if the underlying continues to go up in price, the investor will be able to follow the upwards performance of the underlying via an option call.

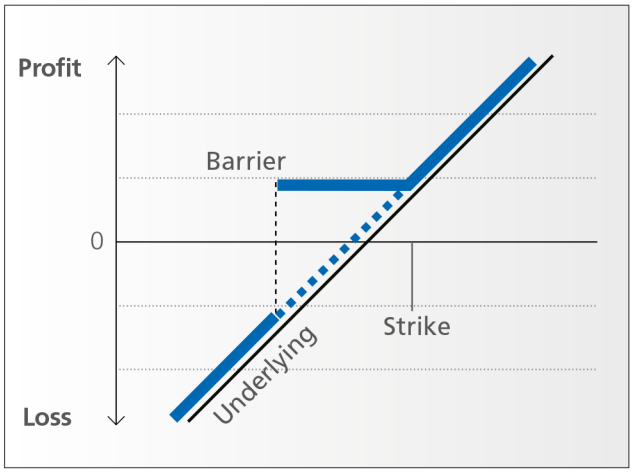

Figure 9: Pay-off of a Bonus Step Up, Source: SVSP

However, for both of these products, the put leg can knock out at strike level, which is the lowest levels of the bonus. If the put knocks out, the bonus step is lost and the product becomes either a simple tracker on the underlying or just an out-performance certificate. These two types of products are especially popular in Netherlands.

4.3 Question 3

4.3.1 First Step

Taking the list that was given to us by the sales team from Netherlands, we must think about what kind of product they would like to issue and what kind of information would be most useful to the traders to decide if they should or not issue in that particular underlying. Firstly, let us start with an obvious measure of liquidity and market stability: the market capitalization. It is important to take this into account since we always have to hedge our positions by the end of the end and illiquidity risks are quite real: we want to avoid issuing on an underlying that does not have the capability to provide the necessary market liquidity during the first and last 30 minutes of the trading day (which is when market makers and investors around the world perform their hedging actions) to avoid closing the book with uncovered risk. Also to pay attention is the currency of the country as some currencies are also quite volatile: we must either have reserves in that particular coin to avoid Forex risk or must pay the conversion price on the spot during the hedge, which can be expensive. But that is mostly for delta hedging; what about the other Greeks? We hedge the gamma and Vega with traded options, so it is important to know if a listed options market is available for that particular underlying. True, we could probably gain a lot from being the first movers in offering such a selection, but that is not the point: remember that this is not about catching market-share and turnover but rather analysing the potential risk of a particular client's request. If the bank risks

a big loss of money by providing this product to a single costumer, then we should not issue. The existence of a listed option market gives us access to products of other competitors, in case we need to hedge our position. Finally, this is a volatility product, so of course, one should look at the volatility of the underlying in question. There are two types of volatility that I advice looking into: historical and implied. As the name implies, historical volatility comes from the past movements of the underlying while implied volatility is taken from the price of the future. At BNPP, we actually have an internal calculator application that provides us with these values: I suggest looking at volatility at 3 months, 6 months and 1 year forward, if possible. Historical volatility can be found easily with Bloomberg or Reuters. Gathering up all the necessary data we can put together a tidy table to present to the traders, as such:

Name	Existing Bonus in StarWarrant 2?	Bloomberg Code	Ric	Market Cap	Listed Option Market	Vol: Implied and Hist. Bloomberg			
						3M	6M	1Y	H. Bloomberg
Activision Blizzard	N	ATVI UW	ATVI.O	18.6 B$	Y	23.99%	25.14%	25.98%	21.64%
Altice	N	ATC NA	ATCE.AS	32.1 B€	Y	42.06%	41.16%	40.09%	46.69%
Amazon	Y	AMZN UW	AMZN.O	202.6 B$	Y	28.75%	28.26%	29.78%	34.16%
AMX	N	AMX	AMX	30.1 B€	N	#N/A	#N/A	#N/A	16.15%
Apple	Y	AAPL UW	AAPL.O	752.5 B$	Y	23.32%	24.35%	25.90%	21.13%
CAC40	N	CAC	.FCHI	1.04 T€	Y	17.80%	17.89%	18.20%	16.61%
Down Jones	Y	INDU	.DJI	5.60 T$	Y	12.81%	14.16%	15.70%	12.66%
Ford	N	F UN	F	61.1 B$	N	18.87%	20.69%	22.88%	16.08%
FTSEMIB	N	FTSEMIB	FTMIB	488.5 B€	Y	20.77%	21.02%	20.78%	18.34%
General Electric	Y	GE UN	GE	278.4 B$	Y	15.57%	15.92%	17.46%	27.10%
Harley Davidson	N	HOG UN	HOG	11.8 B$	Y	22.83%	23.10%	24.02%	28.95%
Heineken	N	HEIA NA	HEIN.AS	41.5 B€	Y	21.41%	21.67%	21.53%	20.77%
IBEX 35	N	IBEX	.IBEX	556.5 B€	Y	19.19%	19.91%	20.23%	15.71%
MacDonalds	N	MDC UN	MDC	95.3 B$	Y	18.93%	18.57%	18.84%	17.86%
Nasdac 100	N	NDX	.NDX	5.19 T$	Y	14.95%	15.93%	17.70%	13.82%
Nasdaq Composite	N	CCMP	.IXIC	7.75 T$	N	27.21%	26.49%	25.96%	12.90%
Nikkei	N	NKY	.N225	377.4 T¥	Y	18.34%	18.92%	19.29%	13.53%
NN Group	N	NN NA	NN.AS	9.2 B€	Y	22.41%	21.88%	21.45%	15.31%
Qualcomm	N	QCOM UW	QCOM.O	114.3 B$	Y	20.71%	20.87%	22.30%	18.65%
Russel 2000	N	RTY	.RUT	2.21 T$	Y	#N/A	#N/A	#N/A	13.09%
S&P 500	Y	SPX	.SPX	19.63 T$ (R)	Y	12.73%	14.32%	16.23%	11.50%
TomTom	N	TOM2 NA	TOM2.AS	2.2 B€	Y	46.12%	44.73%	43.30%	50.19%
Unilever	N	UNA NA	Unc.AS	119.2 B€	Y	20.46%	20.24%	20.51%	20.95%
Verizon	N	VZ UN	VZ	203.4 B$	Y	13.33%	14.64%	16.58%	11.42%
Wallmart	N	WMT UN	WMT	244.9 B$	Y	14.65%	15.54%	16.43%	17.46%

Figure 10: Complete Underlying Analysis

4.3.2 Second Step

You have delivered the list to the traders and thanks to your analysis they have made the selection of stocks on which to issue upon: Harley Davidson, Ford, Unilever, Heineken and Apple. They have asked you to make an initial proposal for the product's parameters to be able to price it correctly on the market. Using the template in Figure 2 as an aid, we can easily set up the main parameters for the system.

The issuing parity for any kind of bonus on the desk is always 1 and the percentage of spot variation in accordance to product price is also fixed at 0.02 percent; this is usually the default value for our products, although some markets or underliers may change this. A notable exception is the commodities market (precious metals and Brent) as well as some Asian indexes (HIS, HSCEI, etc). Adding to this, the market for Amsterdam has an additional peculiarity: we price all of our products in this market using a percentage spread of 0.5 percent. This is due to the nature of the investors for this country: they prefer a spread that shifts dynamically with the price of the product rather than a fixed spread of a few cents. For us market makers, this is more suitable, since the spread applied will follow the shifts of the market as the price of the products adjusts with the spot of the underlying. However, not all investors prefer this: in the French market, fixed spreads are the accepted norm as investors find this much easier to calculate; for us, it implies some extra work with the hedging mechanisms to prevent arbitrages if the spot of the underlying is

jumping drastically on the market. Choosing spreads depends very much on the nature of the investors of that particular country as well as the underlying's implied volatility.

The "Vol BS" parameter is where we define the volatility for the Black, F. and Scholes, M. (1973) model for pricing. Note that we do not use a pure BS model for pricing (as we'll see latter) however we do define these parameters to give stability to the model, according to the maturity of the legs of the option: the higher the maturity, the higher the input for volatility. The "Rho Div Shift" parameter adds an extra to the original Black, F. and Scholes, M. (1973), model: this tells our internal model by how much should we shift our volatility after a dividend release, in order to adjust prices after this type of event.

The contribution size chosen should be adjusted according to the order book in the market: the order book can be accessed on Reuters or Bloomberg and allows you to see the size and price of all orders currently placed in the order books. As buy and sell orders gets matched-up, the price shifts accordingly and new orders are put thought. The order book is important as it gives you a good perspective of the trading activity of that underlying and what should be the offered quantity in your product: the trick is to place the quantity so that it should be fulfilled in a single quote but not big enough that several orders could be fulfilled in a second, so as to prevent arbitrage. Another warning against very large quantities is regarding the liquidity of the underlying: for a small stock with small to moderate market

liquidity, a large-sized order from a BNPP product could actually shift the price. The investor sees this and realises what is happening, reversing his order quickly to gain an immediate profit via the artificial shift.

Finally, adding the hedging parameters on the right is especially important for the traders to determine any new emission. The traded quantity chosen will influence greatly the amount of stocks we will need to purchase or sell to hedge the position of the trade. This, combined with the spot, the liquidity of the underlying and the implied volatility will all affect how much money we will have to pay of the hedge, if it is executed at the max quantity level. This value combined with the order book should give a good idea of the parameters for a new emission. As such, please find on Figure 11 the approved proposal.

4.4 Question 4

For the Corporate action on Reed Elsevier NV, we look to the public information given to us by the exchange. The company will not only be changing names (something we must tell out IT team to adapt in our systems, so we may continue to pull the correct spot from the market), but will also issue bonus as such: each shareholder shall receive 0.538 bonus share for each share already held at the time of the corporate action. More, were told that the changes will take effect after the market close of the 30th of June and previous contracts shall receive an adjustment as per

UNILEVER DR/d		
RIC	Bonus Step Up	Suggestion
Unc.AS	Size	5000
	Parity	1
	% Spread (NL)	0.50%
	Fixed fees	0.02
	Rho Div Shift	0.5
	Spot Var	0.02%
	Vol BS <1y/1-2y/>2y	-0.5/-1/-1.5

Hedge Analysis	
Hedge €	92,469 €
Number of Stocks	2500
Assumed Delta	50%
Spread (€ and Parity Adjusted]	0.005
FX Rate	1
Parity	1
Spot	36.99

Bid/Ask	36.985	36.990

HARLEY-DAVIDSON/d		
RIC	Bonus Step Up	Suggestion
HOG	Size	1500
	Parity	1
	% Spread (NL)	0.50%
	Fixed fees	0.05
	Rho Div Shift	0.3
	Spot Var	0.02%
	Vol BS <1y/1-2y/>2y	-1.5/-2/-2.5

Hedge Analysis	
Hedge €	36,425 €
Number of Stocks	750
Assumed Delta	50%
Spread (€ and Parity Adjusted]	0.009
FX Rate	1.116
Parity	1
Spot	54.20

Bid/Ask	54.195	54.205

FORD MOTOR CO/d		
RIC	Bonus Step Up	Suggestion
F	Size	1000
	Parity	1
	% Spread (NL)	0.50%
	Fixed fees	0.02
	Rho Div Shift	0.3
	Spot Var	0.02%
	Vol BS <1y/1-2y/>2y	-1.5/-2/-2.5

Hedge Analysis	
Hedge €	6,720 €
Number of Stocks	500
Assumed Delta	50%
Spread (€ and Parity Adjusted]	0.009
FX Rate	1.116
Parity	1
Spot	15.00

Bid/Ask	14.995	15.005

HEINEKEN/d		
RIC	Bonus Step Up	Suggestion
HEIN.AS	Size	1000
	Parity	1
	% Spread (NL)	0.50%
	Fixed fees	0.03
	Rho Div Shift	0.3
	Spot Var	0.02%
	Vol BS <1y/1-2y/>2y	-1/-1.5/-2

Hedge Analysis	
Hedge €	33,654 €
Number of Stocks	500
Assumed Delta	50%
Spread (€ and Parity Adjusted]	0.005
FX Rate	1
Parity	1
Spot	67.31

Bid/Ask	67.305	67.310

APPLE INC/d		
RIC	Bonus Step Up	Suggestion
AAPL.O	Size	5000
	Parity	1
	% Spread (NL)	0.50%
	Fixed fees	0.05
	Rho Div Shift	0.3
	Spot Var	0.02%
	Vol BS <1y/1-2y/>2y	-1/-1.5/-2

Hedge Analysis	
Hedge €	291,956 €
Number of Stocks	2500
Assumed Delta	50%
Spread (€ and Parity Adjusted]	0.011
FX Rate	1.116
Parity	1
Spot	130.33

Bid/Ask	130.323	130.335

Figure 11: Individual Underlying Parameters

the r-factor method, with a ratio of 0.6520. For our current list of Open End Turbos, here is what shall happen: on the 1st of July, we shall have a new underlying as well as a new spot, calculated as

$$Spot_{New} = Spot_{31/06/2015} * R - Factor \tag{2}$$

The capitalized strikes of the products as well as their barriers are subject to change as well:

$$Capitalized\ Strike_{New} = Capitalized\ Strike_{31/06/2015} * R - Factor \tag{3}$$

$$Barrier_{New} = Barrier_{31/06/2015} * R - Factor \tag{4}$$

The idea is that, taking the R-factor as well as the closing spot on the 30th of June and the opening spot on the 1st of July, the prices of our products remain exactly the same, before and after the corporate action. The parity shall become the same value as the R-Factor but the calculation of the price remains the same:

$$Price_{New} = \frac{(Spot_{New} - Capitalized\ Strike_{New})}{Parity} \tag{5}$$

As such, find below the complete set of calculations, with the described formulas applied:

Before

R Factor	Spot Price	Date
0.6502	21.5	30/06/2015

ISIN	Capitalized Strike	SL Buffer	Current Barrier	Parity	Price
NL0009988807	6.367426379	1.075	6.9	1	15.13
NL0010288817	9.397524542	1.075	10.1	1	12.10
NL0010374765	10.33566961	1.075	11.2	1	11.16
NL0010444535	11.28088283	1.075	12.2	1	10.22
NL0010516969	12.3085315	1.075	13.3	1	9.19
NL0010766390	14.62217086	1.075	15.8	1	6.88
NL0010887774	13.77	1.075	14.8	1	7.73
NL0010893681	15.29	1.075	1.5	1	6.21
NL0010904165	16.69	1.075	18	1	4.81
NL0010924890	26.87	1.075	24.8	1	5.37
NL0010927141	29.57	1.075	27.3	1	8.07
NL0010929881	8.73	1.075	20.2	1	12.77
NL0011088414	32.25	1.075	29.8	1	10.75

After

New Spot	Date
13.9793	01/07/2015

ISIN	Capitalized Strike	SL Buffer	Current Barrier	Parity	Price
NL0009988807	4.140100632	1.075	4.49	0.6502	15.13
NL0010288817	6.110270457	1.075	6.57	0.6502	12.10
NL0010374765	6.72025238	1.075	7.28	0.6502	11.16
NL0010444535	7.334830016	1.075	7.93	0.6502	10.22
NL0010516969	8.003007181	1.075	8.65	0.6502	9.19
NL0010766390	9.507335493	1.075	10.27	0.6502	6.88
NL0010887774	8.953254	1.075	9.62	0.6502	7.73
NL0010893681	9.941558	1.075	0.98	0.6502	6.21
NL0010904165	10.851838	1.075	11.70	0.6502	4.81
NL0010924890	17.470874	1.075	16.12	0.6502	5.37
NL0010927141	19.226414	1.075	17.75	0.6502	8.07
NL0010929881	5.676246	1.075	13.13	0.6502	12.77
NL0011088414	20.96895	1.075	19.38	0.6502	10.75

Figure 12: Complete Parameter Proposal

5 Conclusion

I sincerely hope I was able to properly illustrate the most common tasks preformed by newcomers to the ETS Trading desk of BNP Paribas. All of the tasks preformed here used real events and situations, as well as prices and products, which can be

easily found with a quick ISIN search or by going directly to the BNP Paribas product website (link in References). My main objective with this case study was to give a thorough insight of what it feels like to be on this desk, in constant contact with the markets. At the end of this case study, you should feel capable of preforming all of the regular tasks required to Trading Support and be comfortable with dealing with derivative products (both Delta 1 and Volatility), as well as reading legal documentation regarding the specificities of these products.

For additional information and reading, please refer now to the Bibliography and Resources Section below.

6 Bibliography and Resources

6.1 Internal Literature

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Available at: http://www.svsp-verband.ch/home/swissderivativemap.aspx?lang=en

Appendix

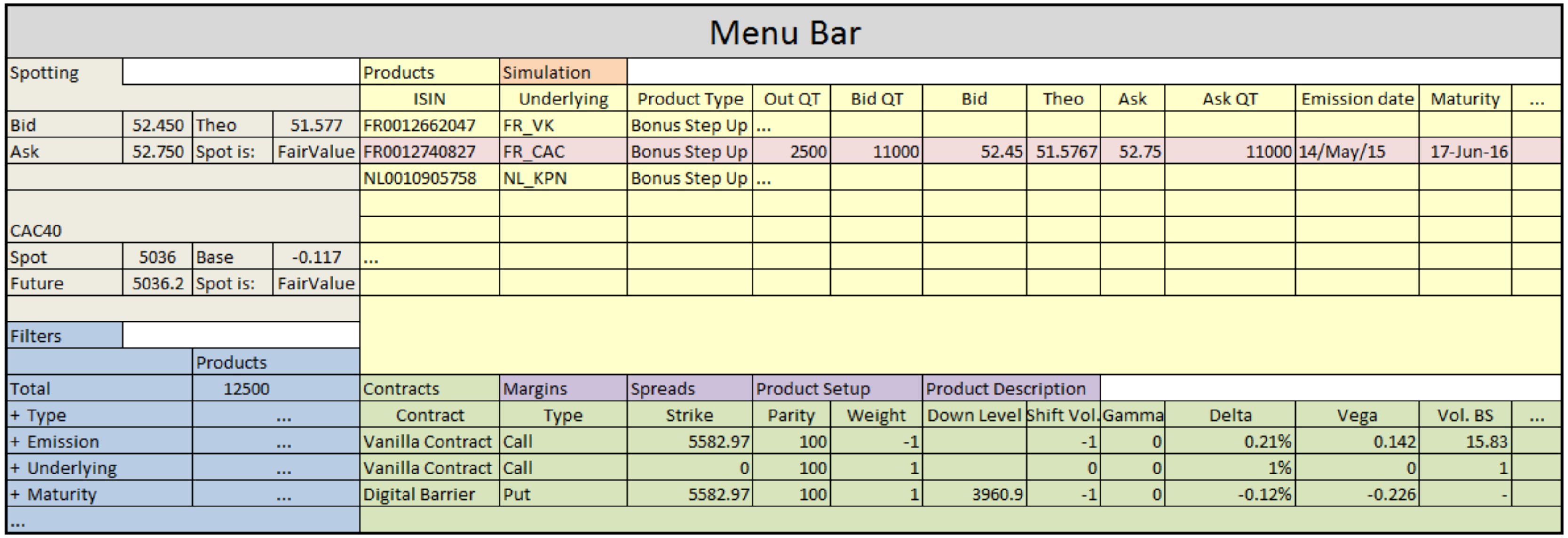


Figure A1: StarWarrant 2 Sketch

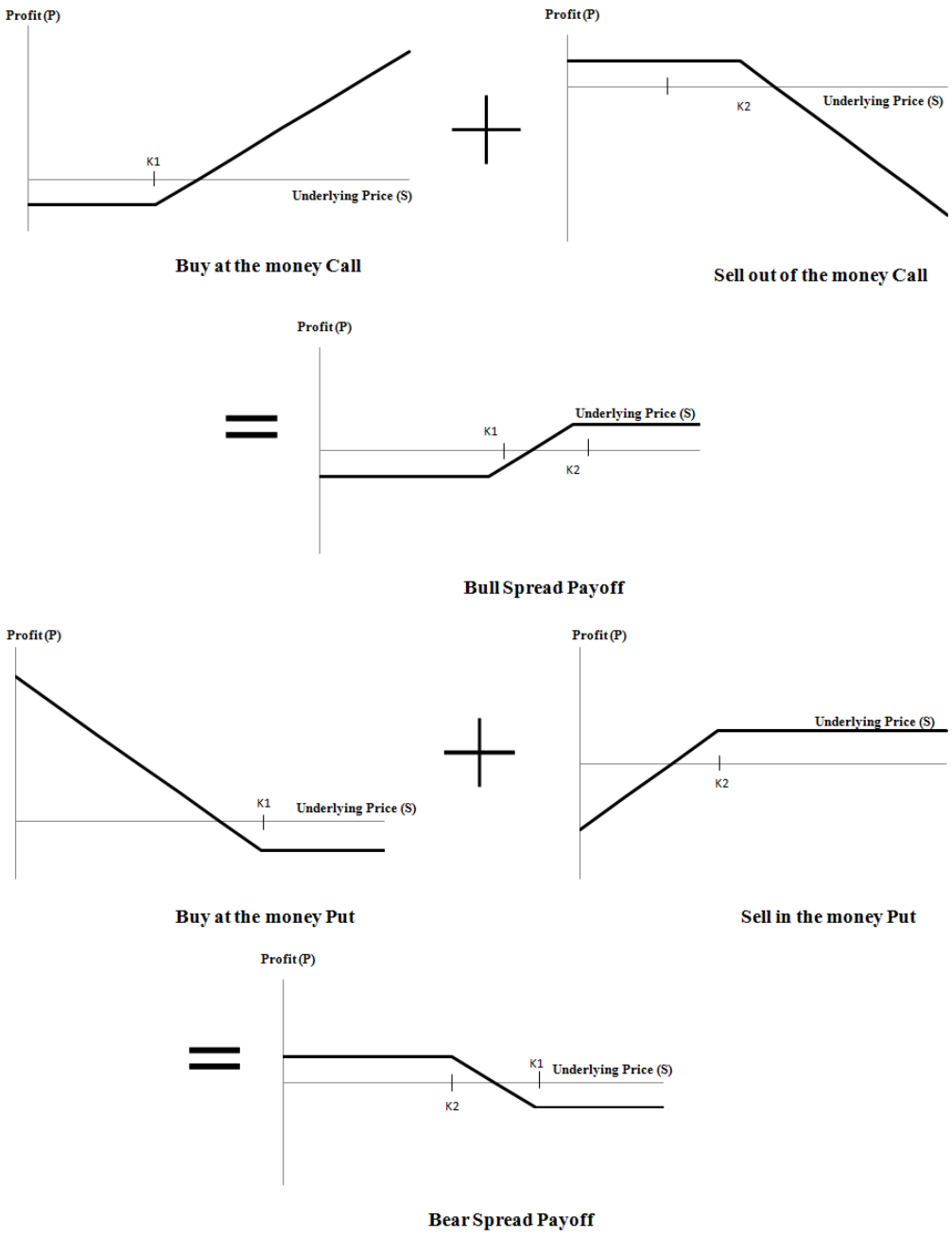


Figure A2: Pay-off of a Call Bull Spread and a Call Bear Spread

Figure A3: ETG Book Trades View Details

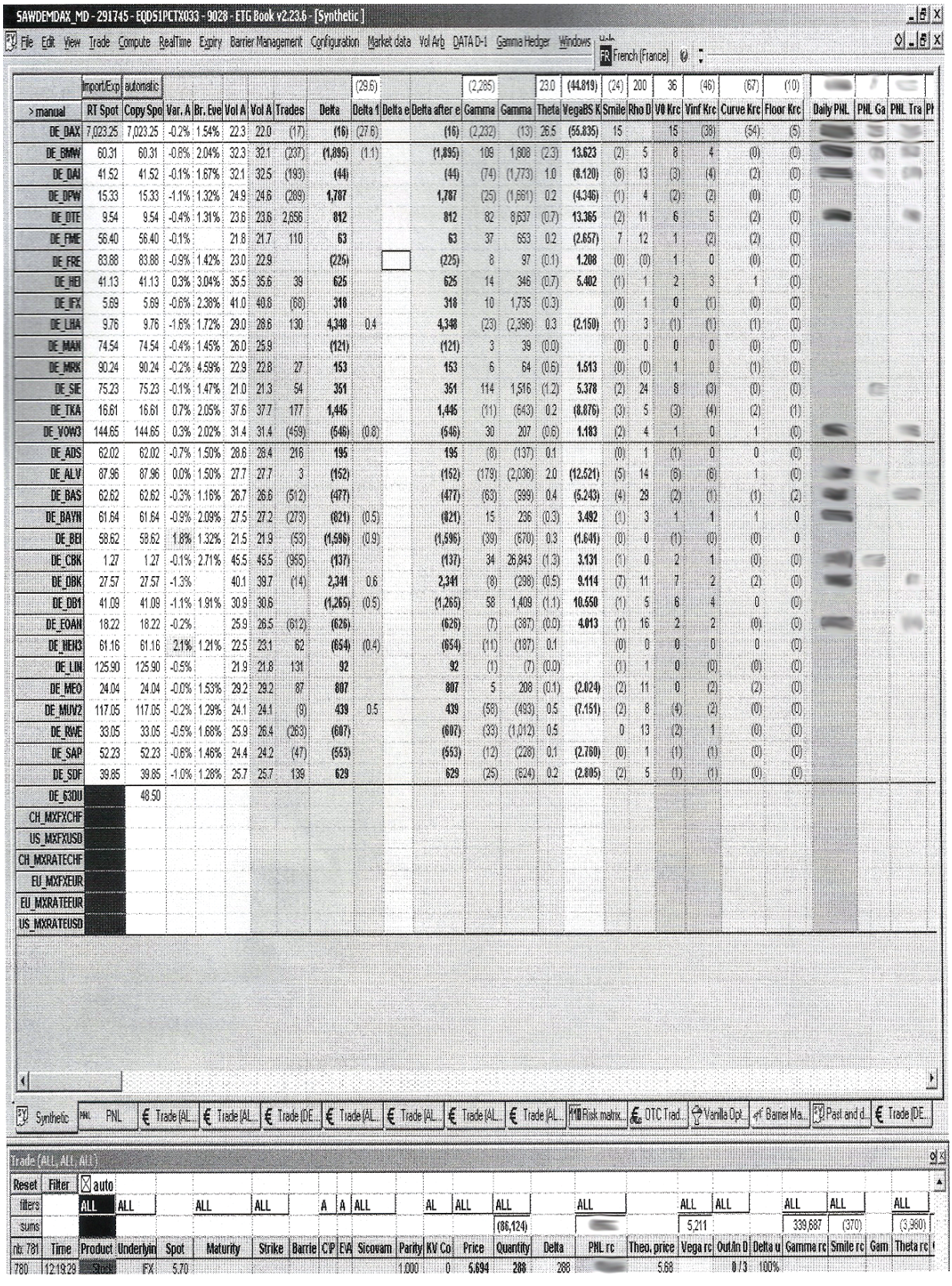


Figure A4: ETG Book Synthetic View and Greeks

SSPA SWISS DERIVATIVE MAP©

SVSP Schweizerischer Verband für Strukturierte Produkte
Swiss Structured Products Association
Associazione Svizzera per prodotti strutturati
Association Suisse Produits Structurés

INVESTMENT PRODUCTS

STRUCTURED PRODUCTS SIX

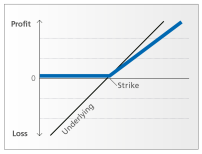
FINANZ und WIRTSCHAFT

dp payoff.ch derivativepartners

11 CAPITAL PROTECTION

Capital Protection Certificate with Participation (1100)

Market expectation
- Rising underlying
- Rising volatility
- Sharply falling underlying possible



Characteristics
- Minimum redemption at expiry equivalent to the capital protection
- Capital protection is defined as a percentage of the nominal (e.g. 100%)
- Capital protection refers to the nominal only, and not to the purchase price
- Value of the product may fall below its capital protection during the lifetime
- Participation in underlying price increase above the strike

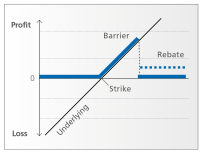
Convertible Certificate (1110)

Market expectation
- Rising underlying
- Rising volatility
- Sharply falling underlying possible

Characteristics
- Minimum redemption at expiry equivalent to the capital protection
- Capital protection is defined as a percentage of the nominal (e.g. 100%)
- Capital protection refers to the nominal only, and not to the purchase price
- Value of the product may fall below its capital protection during the lifetime
- Participation in underlying price increase above the strike (conversion price)
- Coupon payment possible

Barrier Capital Protection Certificate (1130)

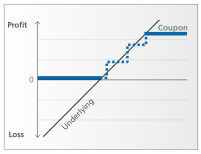
Market expectation
- Rising underlying
- Sharply falling underlying possible
- Underlying is not going to touch or go above the barrier during product lifetime



Characteristics
- Minimum redemption at expiry equivalent to the capital protection
- Capital protection is defined as a percentage of the nominal (e.g. 100%)
- Capital protection refers to the nominal only, and not to the purchase price
- Value of the product may fall below its capital protection during the lifetime
- Participation in underlying price increase above the strike up to the barrier
- Possibility of rebate payment once barrier is breached
- Limited profit potential

Capital Protection Certificate with Coupon (1140)

Market expectation
- Rising underlying
- Sharply falling underlying possible

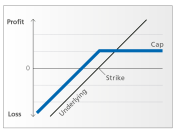


Characteristics
- Minimum redemption at expiry equivalent to the capital protection
- Capital protection is defined as a percentage of the nominal (e.g. 100%)
- Capital protection refers to the nominal only, and not to the purchase price
- Value of the product may fall below its capital protection during the lifetime
- The coupon amount is dependent on the development of the underlying
- Periodic coupon payment is expected
- Limited profit opportunity

12 YIELD ENHANCEMENT

Discount Certificate (1200)

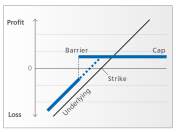
Market expectation
- Underlying moving sideways or slightly rising
- Falling volatility



Characteristics
- Should the underlying close below the strike on expiry, the underlying and/or a cash amount is redeemed
- Discount Certificates enable investors to acquire the underlying at a lower price
- Corresponds to a buy-write-strategy
- Reduced risk compared to a direct investment into the underlying
- With higher risk levels multiple underlyings (Worst-of) allow for higher discounts
- Limited profit opportunity (Cap)

Barrier Discount Certificate (1210)

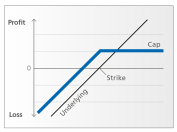
Market expectation
- Underlying moving sideways or slightly rising
- Falling volatility
- Underlying will not breach barrier during product lifetime



Characteristics
- The maximum redemption amount (Cap) is paid out if the barrier is never breached
- Barrier Discount Certificates enable investors to acquire the underlying at a lower price
- Due to the barrier, the probability of maximum redemption is higher; the discount, however, is smaller than for a Discount Certificate
- If the barrier is breached the product changes into a Discount Certificate
- Reduced risk compared to a direct investment into the underlying
- With higher risk levels multiple underlyings (Worst-of) allow for higher discounts or lower barriers
- Limited profit potential (Cap)

Reverse Convertible (1220)

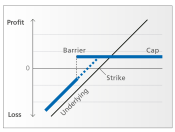
Market expectation
- Underlying moving sideways or slightly rising
- Falling volatility



Characteristics
- Should the underlying close below the strike on expiry, the underlying and/or a cash amount is redeemed
- Should the underlying close above the Strike at expiry, the nominal plus the coupon is paid at redemption
- The coupon is paid regardless of the underlying development
- Reduced risk compared to a direct investment into the underlying
- With higher risk levels, multiple underlyings (Worst-of) allow for higher coupons
- Limited profit potential (Cap)

Barrier Reverse Convertible (1230)

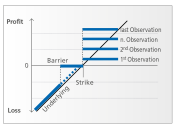
Market expectation
- Underlying moving sideways or slightly rising
- Falling volatility
- Underlying will not breach barrier during product lifetime



Characteristics
- Should the barrier never be breached, the nominal plus coupon is paid at redemption
- Due to the barrier, the probability of maximum redemption is higher; the coupon, however, is smaller than for a Reverse Convertible
- If the barrier is breached the product changes into a Reverse Convertible
- The coupon is paid regardless of the underlying development
- Reduced risk compared to a direct investment into the underlying
- With higher risk levels, multiple underlyings (Worst-of) allow for higher coupons or lower barriers
- Limited profit potential (Cap)

Express Certificate (1260)

Market expectation
- Underlying moving sideways or slightly rising
- Decreasing volatility
- Underlying will not breach barrier during product lifetime

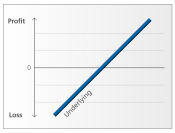


Characteristics
- Should the underlying trade above the Strike on the observation date, an early redemption consisting of nominal plus an additional coupon amount is paid
- Offers the possibility of an early redemption combined with an attractive yield opportunity
- Reduced risk compared to a direct investment into the underlying
- With higher risk levels, multiple underlyings (Worst-of) allow for higher coupons or lower barriers
- Limited profit opportunity (Cap)

13 PARTICIPATION

Tracker Certificate (1300)

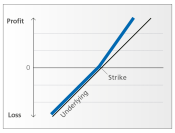
Market expectation
- Rising underlying



Characteristics
- Participation in development of the underlying
- Reflects underlying price moves 1:1 (adjusted by conversion ratio and any related fees)
- Risk comparable to direct investment in the underlying

Outperformance Certificate (1310)

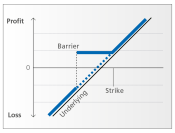
Market expectation
- Rising underlying
- Rising volatility



Characteristics
- Participation in development of the underlying
- Disproportionate participation (outperformance) in positive performance above the strike
- Reflects underlying price moves 1:1 when below the Strike
- Risk comparable to direct investment in the underlying

Bonus Certificate (1320)

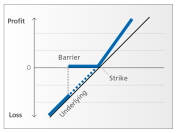
Market expectation
- Underlying moving sideways or rising
- Underlying will not breach barrier during product lifetime



Characteristics
- Participation in development of the underlying
- Minimum redemption is equal to the nominal provided the barrier has not been breached
- If the barrier is breached the product changes into a Tracker Certificate
- With greater risk multiple underlyings (Worst-of) allow for a higher bonus level or lower barrier
- Reduced risk compared to a direct investment into the underlying

Bonus Outperformance Certificate (1330)

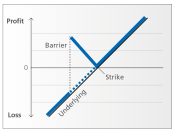
Market expectation
- Rising underlying
- Underlying will not breach barrier during product lifetime



Characteristics
- Participation in development of the underlying
- Disproportionate participation (outperformance) in positive performance above the strike
- Minimum redemption is equal to the nominal provided the barrier has not been breached
- If the barrier is breached the product changes into a Outperformance Certificate
- With greater risk multiple underlyings (Worst-of) allow for a higher bonus level or lower barrier
- Reduced risk compared to a direct investment into the underlying

Twin-Win Certificate (1340)

Market expectation
- Rising or slightly falling underlying
- Underlying will not breach barrier during product lifetime



Characteristics
- Participation in development of the underlying
- Profits possible with rising and falling underlying
- Falling underlying price converts into profit up to the barrier
- Minimum redemption is equal to the nominal provided the barrier has not been breached
- If the barrier is breached the product changes into a Tracker Certificate
- With higher risk levels, multiple underlyings (Worst-of) allow for a higher bonus level or lower barrier
- Reduced risk compared to a direct investment into the underlying

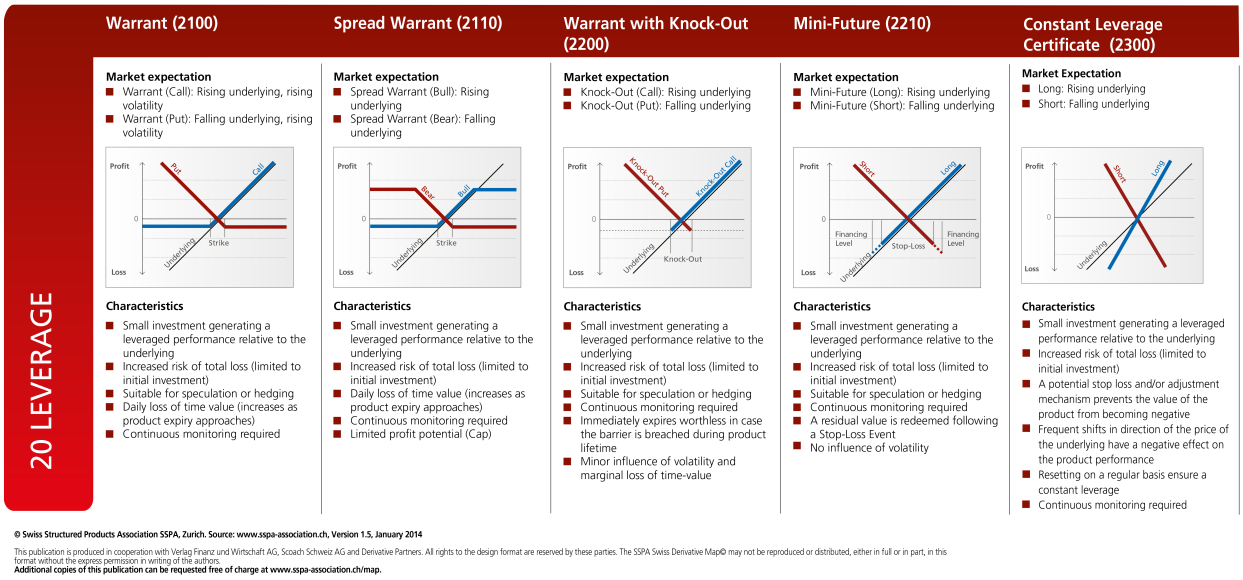


Figure A5: Swiss Derivatives Map

CORPORATE ACTION NOTICE

ICE Futures Europe Market: Notice No. CA/2015/110/Lo

Issue Date: 19 March 2015

Effective Date: 1 July 2015

Contracts:

Universal Stock Future	REN
Flexible Universal Stock Future	RKY, RKZ
Flexible Universal Stock Option	RKU, RKQ, RKJ, RKX

Company: **OLD:** Reed Elsevier NV

NEW: Relx NV

Corporate action: Name Change & Bonus issue

Reference: Reed Elsevier NV has announced a proposal to change the company name to: Relx NV and a bonus issue whereby shareholders will receive 0.538 bonus share for each share held.

Conditions: Subject to shareholder approval at the Annual General Meeting to be held on 22 April 2015

ISIN: NL0006144495

Adjustments: After the close of business on 30 June 2015 the following contract adjustments will be made:

The contracts will be referred to by ICE Futures Europe as Relx NV.

- Ratio method.
- Ratio: 0.65020

Options:

- Lot Size: the lot size will be divided by the ratio. The adjusted lot size will be specified in the Final Notice. The rounding difference will be neutralised by means of an equalisation payment.
- Exercise Prices: The exercise prices will be multiplied by the ratio. The adjusted exercise prices will be specified in the Final Notice.

Futures:

- **Lot Size:** The lot size will be divided by the ratio. The adjusted lot size will be specified in the Final Notice.

- **Variation Margin:** Daily Settlement Prices on 30 June 2015 shall be multiplied by the ratio to generate reference prices for the purpose of variation margin calculations at the close of business on the 1 July 2015 2015.

CORPORATE ACTION NOTICE

This Notice is issued pursuant to the Corporate Actions Policy for ICE Futures Europe which is available here. It requires the immediate attention of Members' staff involved with the trading and settlement of equity products on these markets. Members should ensure that clients are made aware of the arrangements detailed in this Notice.

For further information in relation to this Notice, members should contact:

ICE Futures Europe:		
ICE Corporate Actions	+44 (0) 20 7382 8205	iceeuropecorporateactions@theice.com Web: Corporate Actions
ICE Clear Europe:		
Clearing Operations	+44 (0)20 7065 7600	iceuops@theice.com

Figure A6: Corporate Action Notice on Reed Elsevier NV