LEVERAGE CERTIFICATES' DESIGN WITHIN THE PORTFOLIO MANAGEMENT

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Abstract: *The paper examines an analysis of leverage certificates (namely turbo certificates), where their value is derived from an underlying asset and barrier options. Turbo certificates are riskier financial instruments that provide much more gains or losses due to leverage effect. There are introduced long turbo (for increasing markets) and short turbo certificates (for markets drop). The replicating portfolios profit is identical to a profit from the combination of an underlying asset and barrier options as it is proved in the paper. Based on theoretical approach, replicating portfolios for long and short turbo certificates on Google and Facebook companies are engineered with various parameters and calculated the certificates prices and financial leverages. Their profitability is disproportionately high what it is proved due to low capital investment and the leverage. The main objective is to demonstrate the nature of the given certificates creation using barrier options in an analytical form. The use of proposed turbo certificates can be one of the alternatives for creating a diversified portfolio for investors to reduce risk in case of unforeseen stock price developments. The results of our analysis help the increasing of the intellectualization of all potential investors. After that they will be able to make the best investment decisions in future according to the expectations of UA's price development.*

Keywords: *Long Turbo Certificate, Short Turbo Certificate, Barrier Options, Financial Leverage, Profitability.*

JEL Classification: *G11, G13.*

Introduction

In today's market economy, a large variety of structured products is an expression of a well-functioning market and strong competition between issuers (banks and financial institutions). The large number of structured products is caused due to different variety of characteristics and features of these products. These include a wide range of underlying assets (to be referred as UA henceforth) as stocks, indices, commodities, currencies etc., amount of risk involved, market orientation and maturities. Many studies (Bluemke, 2009; Choudhry, 2004) introduce these modern structured products. According to Brechmann (2008), structured products are derivative financial securities issued by individual issuers. They are linked to the issuer's creditworthiness, but their value is derived from the other financial instruments' development. There is included for example stocks, indices, commodities, currencies, exchange rates and interest rates. Paik (2013) have stated that structured products are a generalization of standard options or derivatives, and specifically turbo certificates are a generalization of classical barrier options.

The main paper's purpose is to introduce and analyse long turbo and short turbo certificates which belong to the leverage certificates. These certificates are highly speculative tools that offer an investor to disproportionately higher investments through leverage. The advantage of short certificates is their ability to participate in

decreasing trends, so they are an interesting option for creating a portfolio of different securities. The research problem is to show the possibility of these products' creation based on barrier options in an analytical form, which belong to the significant part of the financial engineering. Also the background of these products is presented using literature review so that we could continue in our research. The paper's research is applied in Google and Facebook companies. Our findings should help to increase the investors' ability to understand these certificates' creations. Based on the results of the approach, the investors are able to make the best investment decisions in the future according to the expectations of the UA's price development.

1 Statement of a problem

Turbo certificates (or leverage certificates) are a subgroup of structured products. It is a new group of financial instruments that connect the basic features of classical investment instruments together with derivative instruments (Bluemke, 2009). They are highly speculative tools that allow an investor to disproportionately higher investments through leverage. Investor participates in UA's price development without the need for direct investment. Either investing in turbo certificates provides an opportunity to speculate on UA's price increases or price decreases. Long turbo certificates (to be referred as LT henceforth) enable the investor to profit from increasing markets by tracking the UA. On the other hand, short turbo certificates (to be referred as ST henceforth) enable the investor to profit from markets drop by tracking the UA in an inverse manner. The barrier level is set below (LT) or above (ST) actual UA's spot price. Obviously, in the event that markets move the wrong way, investor would multiply any loss too. However, the maximum loss is limited by the capital-invested amount, i.e. investor cannot lose more than he invests. These products are the object of our research.

On the basis of existing studies (introduced below) we can explore the financial engineering principles to the long turbo and short turbo certificates creation using the analytical expression of the barrier options. Also, the pricing formulas to our designed certificates are determined. Consequently, several certificates on Google and Facebook companies using different factors are created, compared and analysed with the aim to investigate the investor's profitability based on the expected shares development scenarios in the maturity date. Using the relation (1) our research is based on real European vanilla options. The demonstration of the creation of these certificates on our selected UA may contribute to the creation of diversified portfolio based on investor's risk-return profile. Our findings should help to increase the investors´ ability to understand these certificates' creations. Based on the results of the approach, the investors are able to make the best investment decisions in the future according to the expectations of the UA's price development. On the other hand, the application can be realized on various financial asset classes (indices, commodities…), the use of which may be widened in the scientific and the commercial area.

1.1 Literature review

Over the last years, investment in turbo certificates has attracted the attention of a large body of financial studies, which have investigated both the theory and the practice of these products use and their design. For example, Mahayni and Suchanecki

(2006) have dealt with the design of Turbo certificates belonging to the special forms of barrier options. They have showed that the relation between the barrier level and the strike price is especially important with a certain choice of these parameters. Wilkens and Stoimenov (2007) have provided the empirical analysis of the leverage products pricing in the German retail market. Entrop et al. (2009) have analysed open-end leverage certificates on the German market. Rossetto and Bommel (2009) have dealt with the endless leverage certificates, which are partly financed with a loan from an issuing bank. Šoltés (2010a) have characterized modern investment tools (namely Turbo Certificates) for trading crude oil, which have used the leverage effect significantly. Marasović and Šego (2011) have developed more than 60 models for options pricing used for pricing warrants and turbo certificates with the application in the Croatian capital market. Paik (2013) wrote an extensive thesis about valuation, empirical analysis and optimal exercise of open-end turbo certificates on the German market. Meyer et al. (2014) have studied the trading behavior of retail investors in the market of leveraged bank-issued retail derivatives. They have investigated whether retail investors have private information or whether they gamble without private information. These authors have widen their research, where later Schroff et al. (2016) have studied the impact of retail investor information demand on trading in leverage structured products. Baller et al. (2016) have presented the theoretical model of the profit maximizing price-setting policy for the issuers of exchange-traded retail certificates used data from the German market for leverage certificates. Other new modified types of the bonus or guarantee certificates using vanilla and barrier options is proposed by Harčariková (2016) and Gordiaková and Younis (2013).

Following the existing literature, we will study turbo certificates' creation and their application in Google and Facebook companies. To our knowledge, turbo certificates designs have not yet been widely investigated using analytical expression of barrier options.

2 Research methods

The methodology of the paper is based on options and option strategies, which introduce the basic part of every investment certificates. According to Hull (2012), option is a financial contract with the right for holder (the owner) to buy (call) or sell (put) UA at a certain date (either at the expiration date of option - European style or at any time up to the option expiration period – American style) for a certain price (the strike or the expiration price). The seller (the writer) of the call/put option receives the option premium for buyer's right. Exotic options are a higher generation of options with a widely used class of barrier options. They are developed for a number of reasons, such as hedging need in the market (Šoltés and Rusnáková, 2013) or products' design to reflect a view on a potential future movements (Šoltés, 2010b; Younis and Rusnáková, 2014). Barrier options contain the second barrier level (known as the second strike price, to be referred as B henceforth). According to Zhang (1998) there are 16 types of barrier options that depend on the activation/deactivation of options (in/out option) and the barrier level's placement (up/down option), i.e. UI/UO/DI/DO call (c)/put ($\overline{p}$) options. In the case of barrier options' valuation Rubinstein and Reiner (1991) applied Black-Sholes-Merton formula (Merton, 1973) on 8 basic types of barrier options and Haug (1997) on all 16 types of standard

European barrier options. Finally, a mathematical structure of barrier options value was derived by Rich (1997). It is valid the relation

$$c_{DI}\left(\bar{p}_{DI}\right)+c_{DO}\left(\bar{p}_{DO}\right)=c\left(\bar{p}\right) \tag{1}$$

The analytical expression of profit functions for selected barrier options is used within the turbo certificates' creation. The payout profile's analytical expression for **LT certificate**, where $strike = B$ (or $strike < B$ but $B < S_0$), is shown as:

$$P(S_t)_{LT} = \begin{cases} np(S_{STRIKE} - S_0) & if\ S_t \le B, \\ np(S_t - S_0) & if\ S_t > B, \end{cases} \tag{2}$$

with time $0 \le t \le T$ period and actual UA's spot price (S_0), the subscription ratio (p) and number of certificates (n). If the UA's price does not reach B, the investor's profit will be the same as the profit from the linear certificate (to be referred as LC henceforth, where LC is the simplest certificate which follows the underlying asset's price development with some subscription ratio). However, the initial investment of LT is significantly lower, the investor will achieve a disproportional appreciation of the amount invested by the leverage (to be referred as L henceforth). The payout profile's analytical expression for **ST certificate** is derived as (3), where $strike = B$ (or $strike > B$ but $B > S_0$):

$$P(S_t)_{ST} = \begin{cases} np(S_0 - S_t) & if\ S_t < B, \\ np(S_0 - S_{STRIKE}) & if\ S_t \ge B. \end{cases} \tag{3}$$

Products themselves are based on the principle of credit trading. The issuer finances a certain part of UA's price value (the strike price) and the investor (product price) finances the rest of the price. LT certificate's price is calculated as

$$k_{LT} = p(S_t - S_{STRIKE}) + FC, \tag{4}$$

where the UA's price (St) is reduced by the strike value (S_{STRIKE}). There is concluded that the exercise price is higher than the strike value and the investor funds the difference. This difference is multiply by the subscription ratio (p) and issuer's financial costs (FC) are added. ST certificates are expressed by following relationship:

$$k_{ST} = p(S_{STRIKE} - S_t) + FC. \tag{5}$$

Above mentioned it is derived that the factors such as S_{STRIKE}, p and FC has the most influence on the certificate's price. Scholz et al. (2005) have examined whether the certificate's prices were consistent with the published price formula. They found that price estimates are distorted in favor of the issuer, i.e. the higher issuer's costs are charged than they actually are. Another factor is volatility, but its impact is only low. The size of the financial leverage (P) changes during the LT (ST) certificate existence and can be calculated based on the relationship:

$$P = \frac{S_t \cdot p}{k_{LT(ST)}}, \tag{6}$$

It is valid, P increases with the increasing of the strike price at ceteris paribus. The next factor is the certificate's price (k_{LT}). If k_{LT} drops, P increases because the investor needs fewer resources to invest in the UA and vice versa.

3 Problem solving

3.1 Analysis of the creation

Suppose, certificate's issuer buys n DO call options. If the multiplier p should be secured, then n/p certificates are necessary to sell. It means, the issuer sells x certificates and specifies the multiplier p, then he has to buy xp call barrier options. Also, the certificate's expiration date should be the same as option's expiration date or both of tools should be issued in open-end form. Comparison of the relation (2), the LT certificate can be created based on the following operations:

- Selling n/p LT certificates and gaining $n \cdot k_{LT}$ amount of money,
- Buying n DO call options with option premium c_{1N}. Mentioned above, k_{LT} is increased by the issuer's cost, including DO call option's premium. Issuer does not need any money due to gaining resources from investor.
- Free resources in amount of $NV = n \cdot (k_{LT} - c_{1N})$ remains issuer after cost reduction. These resources can be deposited at interest rate r_1 to the time of certificate's expiration, where the issuer gains the amount of money, i.e. $NV \cdot r_1 \cdot T/360$ at the time of expiration as the compensation for providing "a loan" to investor in amount of the strike price.

At the time of expiration 2 scenarios can be: The UA is under the barrier $(S_t \leq B)$ during time to maturity, investor suffers a total loss or certificate's residual value is paid to him. Issuer gains deposit together with interests and suffers a loss in amount of option premium, which investor finally pays as part of the certificate's price. The UA is above the barrier $(S_t > B)$ during time to maturity, issuer realizes the option contract and buys the UA at the strike price X and then sells the UA at the actual spot price S_t in the financial market. The results $(S_t - X)$ of these operations can be positive (gain) or negative (loss). The gain or loss will be divided among the investors based on the multiplier p.

Paik (2013) states that the **ST certificates** are a modification of UO put option with B equals the strike value. In the case of UO options, B is above the strike price X and the given option is active until B is reached. At the time T_0 the issuer realizes the following operations:

- Sells n/p ST certificates and gaining $NV = n \cdot (k_{ST} - p_{1N})$ amount of money,
- Buys n UO put options with option premium p_{1N}, which he finances based on the resources received from investors.
- After cost reduction, free resources in amount of $NV = n \cdot (k_{ST} - p_{1N})$ remains issuer. He can invest these resources in the financial market, where we can calculate deposited amount of money with the interest.

At the time of expiration 2 scenarios can be, i.e. B is reached $(S_t \geq B)$ during time to maturity, then investor suffers a total loss or certificate's residual value is paid to him. On the other hand, B is not reached $(S_t < B)$ during time to maturity, the issuer realizes the option contract (i.e. sells the UA at the strike price X and then buys the UA at the actual spot price S_t). From the mentioned above we can conclude that given certificates are created using barrier options' modifications. Certificate's creation is not connected with additional issuer costs due to the fact that option premium is a part of certificate's price and he gains interest r_1 for borrowing money in the amount of the strike price.

Alternative investment of **LT certificate** can be created using following operations: Issuer (bank or financial institution) buys n LC with p for which he pays $np \cdot S_0$. Suppose issuer has money in amount of K, i.e. he buys $n = K/(p \cdot S_0)$ certificates. Profit function from the long position is illustrated as

$$P_1(S_t) = np \cdot (S_t - S_0). \tag{7}$$

Issuer buys np DI put options (due to security of UA's price drop) on the same UA with the strike price equals the barrier level of the certificate B_{LT}, barrier level B_1, where $(B_1 < B_{LT})$, option premium p_{1B} and identical expiration period of the options as the expiration period of the certificates $0 \leq t \leq T$.

$$P_2(S_t) = \begin{cases} -np \cdot \overline{p_{1B}} & if\ min(S_t) \geq B_1 \wedge S_t > B_{LT}, \\ -np \cdot \overline{p_{1B}} & if\ min(S_t) \geq B_1 \wedge S_t \leq B_{LT}, \\ -np \cdot (S_t - B_{LT} + \overline{p_{1B}}) & if\ min(S_t) < B_1. \end{cases} \tag{8}$$

Issuer buys np DO put options on the same UA, with the same barrier level B_1, the barrier level of the certificate B_{LT} represents the strike price, option premium p_{2B} and with the same expiration period $0 \leq t \leq T$.

$$P_3(S_t) = \begin{cases} -np \cdot \overline{p_{2B}} & if\ min(S_t) \geq B_1 \wedge S_t > B_{LT}, \\ -np \cdot (S_t - B_{LT} + \overline{p_{2B}}) & if\ min(S_t) \geq B_1 \wedge S_t \leq B_{LT}, \\ -np \cdot \overline{p_{2B}} & if\ min(S_t) < B_1. \end{cases} \tag{9}$$

The issuer generates costs in the amount of the option premiums (issuer's costs FC). FC are the part of k_{LT} and for that reason, the issuer does not need its own resources to create an alternative investment. Created certificates are sold to investors with a certain multiplier p. The option premiums are divided according to p and k_{LT} is increased at least $n \cdot (\overline{p_{1B}} + \overline{p_{2B}})$. Finally, the option premium does not reduce the issuer´s profit, but only increases k_{LT}. After modification of combinations (7), (8) and (9), we have derived following relation

$$P(S_t)_{LT} = \begin{cases} np \cdot (S_t - S_0 - \overline{p_{1B}} - \overline{p_{2B}}) & if\ min\, S_t > B_{LT}, \\ np \cdot (B_{LT} - S_0 - \overline{p_{1B}} - \overline{p_{2B}}) & if\ min\, S_t \leq B_{LT}, \end{cases} \tag{10}$$

which is identical with payout profile's analytical expression for LT certificate (2).

ST certificates are created by similar way, i.e. issuer sells n LC, buys np UI call options and buys np UO call options on the same UA. Derived relation (11) is identical the payout profile's analytical expression for ST certificate (3).

$$P(S_t)_{ST} = \begin{cases} np \cdot (S_0 - S_t - c_{1B} - c_{2B}) & \text{if } \min S_t < B_{ST}, \\ np \cdot (S_0 - B_{ST} - c_{1B} - c_{2B}) & \text{if } \min S_t \geq B_{ST}. \end{cases} \quad (11)$$

The main advantage of investing in turbo certificates is disproportionately higher profits from deposits due to P. There is important to monitor the profitability on turbo certificates. The profitability LT and ST certificates is calculated as

$$\%Profitability(S)_{LT} = \frac{np \cdot (S_t - S_0)}{n \cdot k_{LT0}}, \quad (12)$$

$$\%Profitability(S)_{ST} = \frac{np \cdot (S_0 - S_t)}{n \cdot k_{ST0}}, \quad (13)$$

where used parameters are numbers of the certificates n, the multiplier p, the actual UA's spot price at the issue time S_0, the UA's spot price at the maturity date St and the purchase price of given certificates k_0. Once B is reached, the loss becomes permanent and thus the profitability will be at constant level.

3.2 Analysis and using in portfolio management

Let's design LT and ST certificates on Google (GOOG) and Facebook (FB) where k_{LT} (ST) and $P_{LT\ (ST)}$ are calculated and the payout profiles of the given certificates are derived. GOOG and FB shares are chosen according to the correlation coefficient between them, i.e. 0.44036, where there is a weak interdependence. An annual return for GOOG is 15.43% and for FB is 4.59%. The volatility of the UA is the annualized standard deviation of daily returns computed over up to 1.3 years' worth of historical data, where 22.30% is for GOOG and 31.22% is for FB. Based on the examination of the selected assets, we consider the certificates' design based on these underlying assets to be appropriate. All key information is in Tab. 1. We will use European style options in the turbo certificates' creation. All data are obtained from Yahoo Finance (2018a; 2018b).

Tab. 1: Initial UA's description

Underlying	Issue price	Issue time	Maturity date	Multiplier	Dividends
Google	1087.97	18.10.2018	17.01.2020	0.1	-
Facebook	154.92	18.10.2018	17.01.2020	0.1	-

Source: (Yahoo Finance, 2018a; 2018b)

The strike prices selected according to the strike prices of classical put/call options are in the range of 520-1880 USD for Google shares and 5-320 USD for Facebook shares on 18th October 2018. In total there are created 53 LT(GOOG) certificates, 64 ST(GOOG) certificates, 51 LT(FB) certificates and 55 ST(FB) certificates. For showing we choose only selected strike prices (Strike), which are in Tab. 2 and Tab. 3. Also, following assumptions, i.e. B of the created certificate equals Strike of the put (call) option and Strike is the same or lower (higher) as B for LT (for ST), have to be met. Issuer costs are in amount of put (call) option premiums based on the relation (1). Due to simplification, other transaction costs are not considered.

Tab. 2: The results of the analysis for LT certificates

Google					Facebook				
B_{LT}	$Strike_{LT}$	FC_{LT}	k_{LT}	P_{LT}	B_{LT}	$Strike_{LT}$	FC_{LT}	k_{LT}	P_{LT}
1000	1000	73.92	16.19	6.72	140	140	12.31	2.72	5.69
1000	900	73.92	26.19	4.15	140	130	12.31	3.72	4.16
1000	800	73.92	36.19	3.01	140	120	12.31	4.72	3.28
900	900	43.98	23.20	4.69	130	130	9.05	3.40	4.56
900	**800**	**43.98**	**33.20**	**3.28**	**130**	**120**	**9.05**	**4.40**	**3.52**
900	700	43.98	43.20	2.52	130	110	9.05	5.40	2.87
800	800	20.15	30.81	3.53	120	120	6.35	4.13	3.75
800	700	20.15	40.81	2.67	120	110	6.35	5.13	3.02
700	600	11.80	49.98	2.18	110	100	4.22	5.91	2.62

Source: (Author)

Notes: LT long turbo, B barrier level, FC issuer costs, k certificate's price, P financial leverage.

Tab. 3: The results of the analysis for ST certificates

Google					Facebook				
B_{ST}	$Strike_{ST}$	FC_{ST}	k_{ST}	P_{ST}	B_{ST}	$Strike_{ST}$	FC_{ST}	k_{ST}	P_{ST}
1100	1100	140.00	15.20	7.16	160	160	22.47	2.76	5.62
1100	1200	140.00	25.20	4.32	160	170	22.47	3.76	4.13
1100	1300	140.00	35.20	3.09	160	180	22.47	4.76	3.26
1200	1200	92.00	20.40	5.33	170	170	18.28	3.34	4.64
1200	1300	92.00	30.40	3.58	**170**	**180**	**18.28**	**4.34**	**3.57**
1200	**1400**	**92.00**	**40.40**	**2.69**	170	190	18.28	5.34	2.90
1300	1300	62.00	27.40	3.97	180	180	15.00	4.01	3.87
1300	1400	62.00	37.40	2.91	180	190	15.00	5.01	3.09
1400	1600	46.10	55.81	1.95	190	200	11.45	5.65	2.74

Notes: ST short turbo, B barrier level, FC issuer costs, k certificate's price, P financial leverage.

Source: (Author)

Based on the initial key UA's information, for showing LT(GOOG) certificate can be designed by buying n LC at 108.97 USD/certificate and by buying np DI put and DO put options for GOOG with the same inputs (B 900 USD, Strike 800 USD, expiration time 17th January 2020) as the LT certificate, where issuer pays barrier option premiums. In our case we will use classic put option premiums (sum of barrier options (1)) from real market in amount of 43.98 USD/option. The using of relations (4) and (6), it is possible to calculate k_{LT} and P_{LT} for all selected variants of B and Strike (Tab. 2). All parameters are modified on the basis of the multiplier p. Once all the parameters have been determined, we can deduce the profit function when buying one LT certificate according to relation (10). Profit function of LT(GOOG) certificate for given parameters is shown in Tab. 4. At the time of expiration, 2 scenarios can occur, either B (900 USD) is reached, then investor suffers a loss in amount of 23.20 USD/certificate or B is not reached, the investor's profit is increasing with the UA's price increasing.

Tab. 4: Profit functions of selected LT and ST certificates on GOOG and FB

LT(GOOG)		LT(FB)		ST(GOOG)		ST(FB)	
B>900	$0.1S_T$ -113.20	B>130	$0.1S_T$ -16.40	B<1200	$-0.1S_T$ + 99.60	B<170	$-0.1S_T$ + 13.66
B<900	-23.20	B<130	-3.40	B>1200	-20.40	B>170	-3.34

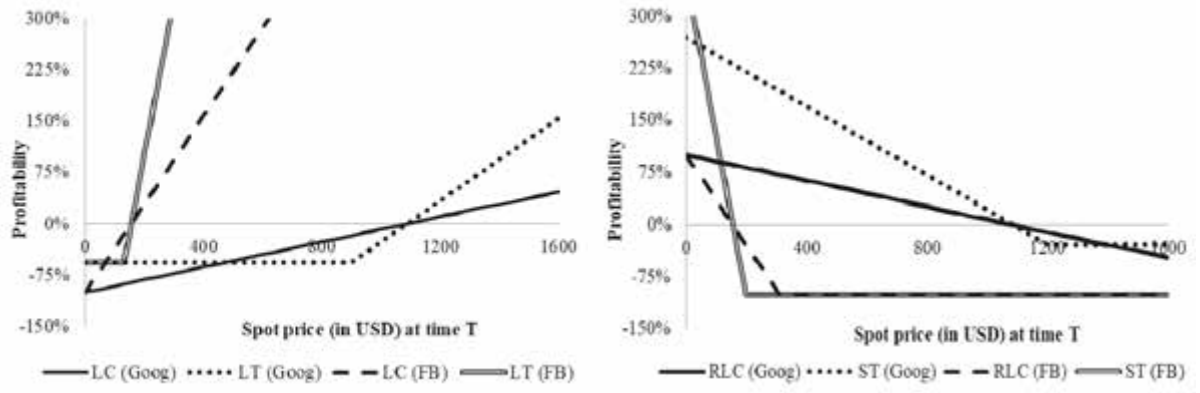
Source: (Author)

ST(GOOG) certificate is possible to create as selling n LC at 108.97 USD/certificate and by buying np UI call and UO call options for GOOG with the

parameters (B 1200 USD, Strike 1400 USD, expiration time 17th January 2020). The use of the relations (5) and (6), there are calculated k_{ST} and P_{ST} (Tab. 3). The ST profit function is derived by the relation (11) with showing in Tab. 4. Also, at the time of expiration, 2 scenarios can occur, either B (1200 USD) is reached, then investor suffers a loss in amount of 20.40 USD/certificate or B is not reached, the investor's profit is increasing with the UA's price drop. In the same way, we can derive profit functions for other certificates, also for FB shares (Tab. 4) with different defined parameters (see Tab. 2 and Tab. 3).

Due to the existence of the financial leverage, there is important to monitor the profitability of turbo certificates in comparison to linear (reverse linear) certificates as it is graphical expressed in Fig. 1 (calculations are according to relations (12) and (13)). This comparison is based on our designed certificates derived in Tab. 4.

Fig. 1: Profitability of designed certificates on 17th January 2020



Notes: LC linear certificate, RLC reverse linear certificate, LT long turbo, ST short turbo

Source: (Author)

Fig. 1 shows the higher turbo certificates' profitability than LC's profitability for LT (if UA's price is increasing above actual UA's spot price S_0) and ST (if UA's price is decreasing below S_0) due to financial leverage. The leverage effect for LT(GOOG) is 3.28, LT(FB) 3.52, ST(GOOG) 2.69 and ST(FB) 3.57. On the other side, the opposite direction (as it was predicted) causes disproportional higher losses than LC's losses. However, LT and ST certificate's loss is limited by invested capital amount. In the same way we can design different turbo certificates for different level of given parameters, ultimately it depends on the investor who chooses the right certificate to his portfolio. Therefore, these certificates are risky, but they can make a higher profit. Due to this fact, they are suitable as one tools in portfolio management.

4 Discussion

From the above mentioned results (Tab. 2, Tab. 3 and Fig. 1) of our analysis we can deduce following facts about creation, the payout profiles and the profitability of turbo certificates.

Turbo certificates have to be created using barrier options. Depends on the multiplier p, the issuer can create a different number of turbo certificates, i.e. if the multiplier is 1:10, it is possible to issue 10 certificates from one barrier option. Down barrier options are used for LT certificates' creation (B is identical or above the strike price but both parameters are lower than actual spot price, i.e. $S_{STRIKE} \leq B < S_t$. Up

barrier options are used for ST certificates' creation (B is identical or below the strike price but both parameters are higher than actual spot price, i.e. $S_t < B \leq S_{STRIKE}$. Following parameters influence turbo certificates' creation, i.e. numbers of the certificates (the number does not impact on the certificate's profitability), the barrier level B (the exercise price of the options), the strike price, the multiplier p (the higher multiplier is, the higher investor's profit is), financial leverage P (the bigger leverage is caused by lower certificate's price – higher strike price) and issuer costs FC (increase the certificate's price). It is valid, the higher (lower) the exercise price of the put (call) option is, the lower barrier distance from UA and the higher probability of reaching the barrier level is. The lower the strike price is, the higher long turbo certificate's price is. However, the higher risk of reaching the barrier level is. The higher strike price is, the higher ST certificate's price is and vice versa. On the other side the optimal distance between strike prices and UA does not exist.

Our approach based on the proposed turbo certificates can be provided as an inspiration for further types of these financial certificates creation. Turbo certificates are designed for speculative investors with an active trading strategy with a leverage effect and having a strong view on the future direction of the underlying market. On the other hand, short certificates are one of the few instruments on the equity market that gives you the chance to benefit from falling markets. Our findings could be useful to investment certificates' issuers who are willing to increase the level of their products' transparency. The findings should help to increase the investors' ability to understand these innovative tools creation. Investors are able to make the best investment decisions in future according to the expectations of UA's price development. This approach is robust for various financial asset classes, such as a commodity, indices or foreign currency, the use of which may be widened in the scientific and the commercial area. Throughout the entire portfolio construction process, it is vital that you remember to maintain your diversification above all else. It is not enough simply to own securities from each asset class; you must also diversify within each class. The paper offers a significant contribution in both an academic and practical sense due to analysis of new financial tools which may be used in practice.

Conclusion

The paper has introduced high-risk investment products (long and short turbo certificates, also referred to as leverage products), which are only suitable for experienced and active investors with a high risk tolerance. There are certificates available both for rising (Long turbo LT) and for falling (Short turbo ST) prices. Turbo certificates are traded by barrier level, in condition that UA reaches this level, they became worthless. Design of these products is expressed through the analytical expression of barrier options. For understanding of turbo certificates' design, it was introduced the review of the literature dealing with these products. Based on the existing empirical studies, the paper's scientific problem is to design and demonstrate the nature of LT and ST certificates creation through financial engineering. It was proved the design using barrier options. LT certificates are a modification of down and out call options. However, the alternative investment is possible to create as buying linear certificates, down and in put options and down and out put options. On the other hand ST is a modification of up and out put options and the alternative investment is

created as selling linear certificates, buying up and in call options and up and out call options. Our empirical approach is applied to Google and Facebook companies, where in total 223 certificates with various parameters are designed, compared and analysed followed by investigation of their profitability. Alternative investments using real market call/put option prices from 18th October 2018 are presented. The main aim of the paper was to prove the nature of these products creations through the barrier options with showing the main parameters influencing of their price and profitability. These products can be used for financing of issuers, not only for banks, but also for governments. Also, certificates have a useful role to play in modern portfolio management. Our approach can provide as an inspiration for creation of the further types of the investment certificates with the increasing of intellectualization of all potential investors in Europe.

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