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THE FORMULA OF EXERCISE PRICE IN EMPLOYEE STOCK OPTIONS – TESTING OF THE PROPOSED APPROACH

Summary: The exercise price in ESO determines the size of the remuneration of an employee according to the market price of a stock. The literature survey of the American experience shows that usually the strike price is equal to the stock's market value at the time the option is granted. The pricing mechanism of ESO in Poland usually is based on the fixed value, mostly corresponding to the nominal price. The author's formula of the exercise price is presented in this article. The aim of the research is the verification of the proposed approach. The data from Warsaw Stock Exchange will be used in the paper. The analysis will particularly use the data from ESO programmes of Polish companies, which were enacted from 1999 to 2014. The research confirms that the variable exercise price should be used in the incentive programmes based on the employee stock options. Tests of the proposed formula have shown that in the majority of ESO programmes the exercise price does not differ much from the market price.

Keywords: employee stock options, exercise price.

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1. Introduction

Employee stock options (ESO) that are granted by a company to its employees as a part of a motivation system give them the right to purchase a certain amount of the company stocks at a fixed time for a specified price. In contrast to publicly traded stock options, whose time to maturity is usually limited to one year, ESOs are a medium- and long-term instrument, the length of which is determined by their specified vesting period and deferred payout. In the literature they are described as a variable component of remuneration of a long-term character [Borkowska 2012, p. 19–21]. Having met certain criteria, an employee can purchase the company stocks at an exercise price specified in their ESO plan. The amount of remuneration depends directly on the exercise price of the company stock in relation to its market price.

The literature survey of the American experience shows that typically the strike price is equal to the stock's market value at the time the option is granted [Hall, Murphy 2000; Bebchuk, Fried 2003; Sircara, Xiong 2007]. In Poland the pricing mechanism of ESO usually is based on the fixed value, mostly corresponding to the nominal price [Majewska 2013]. The fixed formula of the strike price leads to the lack of ESOs' incentive character. In this article the author presents her own variable formula of the exercise price. The aim of the research is to verify the proposed approach. Since the exercise price should not differ significantly from the market price, the relation between these two prices was adopted as the measure of the evaluation. It has been hypothesized that the proposed formula of the strike price in most cases leads to the maintenance of options in the money. There were used descriptive statistics for the analysis of prices determined by the proposed formula.

The study is based on data from the Warsaw Stock Exchange. The range of the study is limited to WSE listed companies because of the difficulty in obtaining information about other entities (due to the fact that they are not obliged to publish reports) and because of their size. Remuneration plans including employee stock options are typical for large companies. The analysis is specifically focused on the data from ESO plans offered by Polish companies from 1999 to 2014. The relevant data come from annual reports, current reports, supervisory boards' resolutions and press announcements.

2. Characteristics of employee stock options

Employee stock options (ESO) differ from standard exchange-traded options in a few important aspects. There are six characteristic elements of ESO:

- a grant date,
- the ESO plan duration,
- employees entitled to receive options,
- vesting criteria,
- a vesting period,
- an exercise price.

A grant date, i.e. the date when the contract is signed, initiates the ESO plan. Then the employees entitled to options are denoted and the vesting criteria are defined, both in loyalty and economic terms. The vesting criteria should correspond to the chief purpose of implementing the employee stock option plans. According to the European Commission's recommendations, award of variable components of remuneration should be subject to predetermined and measurable performance criteria. [Commission Recommendation of 30 April 2009, position 3.2, p. L 120/30]. Apart from financial criteria which are meant to contribute to a company's long-term stability, it is important to take loyalty criteria into consideration as well. Most frequently it means that an employee is made to stay with a company for a specific

period of time. Table 1 shows the basic economic criteria of vesting the employee stock options broken into market and non-market ones.

Table 1. Economic criteria of exercise option

Market criteria	Non-market criteria
Reaching a certain share price	Achieving the planned profit
Reaching a particular rate of return on shares	Achieving the planned increase of the income
Reaching a certain intrinsic value of the option	Achieving the established market share
Reaching a certain level of stock prices compared to the stock index	

Source: [Majewska 2013, p. 193].

If employees meet the loyalty and economic criteria, they become eligible to receive options. Typically, the options can be exercised once the vesting period has ended. It is the vesting period and the deferred payout that determine the ESO's long-term character. In American companies that use this instrument the time available for exercising the options is 4–6 years [Carpenter 1998; Akresh, Hassan 1997; Bettis, Bizjak, Lemmon 2005]. In the case of companies listed on the Warsaw Stock Exchange the average time for exercising the options is 3.3 years, while the average duration of ESO plans is 5.1 years [Trio Management 2010].

The lengthy vesting period, when the external parameters may change significantly, means that the exercise price may differ considerably from the market price. The difference between the current stock price and the exercise price affects the costs incurred by a company in relation with their incentive stock option plan. On the other hand, this spread determines the option holder's profit, thus making the exercise price is so important.

3. Methods of determining the exercise price in ESO

Employee stock options, as a part of the employee stock ownership programmes, are recognized as an expense thus affecting companies' financial performance.¹ The ESO cost should correspond to the market fair value determined on the grant date. One of the elements of the option value is its exercise price. In case of a call option, the lower is the exercise price, the higher the option value. For the company this means higher costs of the incentive programme, while for the employees – higher remuneration after the option execution. It is important to note that employees becoming owners of options do not pay the premium. Their gain is determined by the

¹ Pursuant to ASC 718 [718-10-25-2] and MSSF 2 [standard of share-based payments – IFSR 2.7].

option intrinsic value, i.e. the difference between the current stock price and the exercise price. What is more, as a financial instrument,² the employee stock options are not taxed according to the regulations concerning a basic salary and social insurance contribution. The owner of employee stock options becomes taxable no sooner than on the date of sale of shares.

The available literature on ESO does not provide information about the methods of determining the exercise price. There are some studies relating to the optimal payoff from options with the corresponding exercise price (e.g. [Chen, Pelger 2011; Ross 2004; Dybvig, Loewenstein 2003]. According to Hall and Murphy [2000, p. 209] exercise prices can be set:

- below the grant-date stock price (discount options),
- above the grant-date stock price (premium options),
- indexed to an industry or market index (indexed options).

In the exercise price determination practice it is recommended to apply premium and indexed options. Rappaport [1999] argues that discount and at-the-money options create huge rewards for mediocre performance of executives, especially in a bull market. In order to preserve the incentive character of the employee stock options, their exercise price should not differ significantly from the market price on the grant date.

Basing on the information about incentive plans implemented by companies listed on WSE we can distinguish two methods of the exercise price determination:

- 1) as a constant value which is expressed as a fixed amount,
- 2) as a variable value expressed by means of a formula.

In Poland the most popular are the plans (82%) where the exercise price is a fixed value. Pursuant to Article 309, § 1 of the Commercial Companies Code stocks cannot be granted at a price lower than their nominal value. It is the minimum price at which stocks can be purchased. The Commercial Companies Code sets it at 0.01 zloty (Art. 308). When the exercise price is set at the level of the nominal price, the options are always in-the-money. So constructed employee stock options are a form of reward rather than incentive. What is more, it raises doubts of minority stockholders who do not have much say in decisions regarding granting the options. Unfortunately, in half of the employee stock option plans in WSE companies, the exercise price was equivalent to the nominal company stock price. The companies allowing employees to buy stocks at the minimum price seem not to recognize the principal goal of incentive programmes which they usually define as a tool to create mechanisms motivating their employees to contribute to a longstanding and stable growth of the company value.

² Pursuant to the Act on Trading in Financial Instruments [Ustawa z 29 lipca 2005, art. 2, ust. 1].

The approach where the exercise price is a fixed value has rightly raised criticism against incentive programmes. What is being questioned is the fact that the executives are granted stocks at a minimum price for reasons unrelated to their performance. Many authors (e.g. [Wade, O'Reilly, Pollock 2006; Frey, Osterloh 2005]) express the opinion that employees receive a far too high salary for far too low performance. This is why the employee stock options are perceived as the pay without performance [Bebchuk, Fried 2004; Tosi 2005]. What is also criticized is the approach of supervising authorities and the management to ESOs as an additional element of compensation for which there is no counteraction [Jensen, Murphy, Wruck 2004]. It is particularly obvious in the bull market. The stock prices are going up, but very often the uptrend is not the result of higher staff efficiency.

Determination of the exercise price as a variable value can partly limit the unreasonably high profits from the option call. The literature does not provide readymade formulas of exercise prices based on specific variables. Hall and Murphy [2000] just say that they are indexed to an industry or market index. The classification below (see Table 2) is based on the incentive programmes incorporated by the WSE companies. Obviously, it does not cover all the possible situations.

Table 2. Classification of the exercise price as a variable value

Criterion	Exercise price
Number of factors determining the price	1. Determined by one factor 2. Determined by many factors
A discount	1. No discount 2. With a discount
Type of a discount	1. With a fixed discount 2. With a variable discount
Type of indexation (in the case of a variable discount)	1. Based on market conditions (market indexes) 2. Based on economic conditions (fundamental indexes)
Number of factors indexing the price	1. With one indexing factor 2. With many indexing factors

Source: own study.

Out of all the ESO programmes, analysed in this paper, 18% can be classified as the ones using the variable exercise prices. They are usually based on:

a) an average price in a given period (half of the programmes). It is typically determined on the basis of the closing price prior to the ESO programme incorporation. In the case of the programmes analysed here the period of three months was usually adopted, but there were also the examples of 30 and 70 trading days;

b) a market stock price on a certain date, e.g. the grant date (33% of programmes).

The most common is the market price discount of 5 and 10%, although there are the examples of 40 and 50%. It should, however, be noted that the price discount is applied in the case of the mean price as well.

The applied formulas are not flawless. Their main disadvantages are taking into consideration the period prior to the programme implementation and application a fixed discount rate. The fact that the average price is calculated on the basis of share prices from the period preceding the implementation of an ESO plan, especially a long-term one, can be a result that the intrinsic value of option equals zero and employees simply abandon the option and it expires worthless, even though the remaining criteria have been met. The above limitation will not take place when the exercise price is determined on the basis of stock prices in the vesting period. Then in the changing market situation the exercise price will not differ much from the market price and employees, realising that they will have an opportunity to buy stock at a price lower than the current one, may be motivated to better work. On the other hand, a fixed discount rate takes no account of market conditions – in the bear market it can be too low, while in the bull market – too high.

The options with the variable exercise price discount can be compared to the indexed options described by Hall and Murphy [2000]. Therefore, the need for indexation seems obvious [see A. Rappaport 1999]. On the one hand, it protects the executives against a shaky market, while on the other hand it depends on their performance, particularly in the bull market. However, despite the advantages, indexing of exercise prices is rare in Poland. Only in two ESO programmes analysed in this study the exercise prices were indexed. The companies applied such indexing factors as the volume of stock turnover (Ferro S.A.) and the percentage change of the WIG index (Inter Cars S.A.).

Since the exercise price formulas applied in the WSE companies' ESO programmes have proved to be imperfect, the author comes forward with her own proposal. The exercise price depends on more than one factor and includes a variable discount represented by market indexes. The formula is as follows:

$$X_i = \bar{P}(1 - \sigma) \frac{I_t}{I_0}, \quad (1)$$

where: \bar{P} – an average determined on the basis of the closing stock prices from the vesting period; σ – the stock prices volatility in the vesting period ($\sigma < 1$); I_t – the level of a specified stock market index on the last trading date of the vesting period; I_0 – the level of a specified stock market index on the first trading date of the vesting period.

In the proposed formula the exercise price, contrary to market traded options, is not a constant value. It depends on trends on the market as well as on the risk of investing in a given company's stocks. It is important to take into account the vesting period when determining the values of variables describing the exercise price. In the case of annual reporting periods the number of trading days in a year should be taken into consideration.

4. Testing the proposed exercise price formula

The test of the proposed formula included those companies that revealed data concerning their incentive programmes in 1999–2014. The author collected information about stock prices of 116 companies. Due to the fact that in most of the companies usually the vesting period lasted one year (at the end of the year it was checked if an employee had met the economic requirements), the author decided to adopt 12 months to be a vesting period in her considerations. It should be noted that an employee may be denied the options in one year, but the following year the decision may be changed for their benefit. This is why the exercise price was determined at the beginning of each year of the incentive programme.

The study was carried out in the following stages:

1. Calculating the average of stock prices in individual years.
2. Determining the volatility of stock prices.

The volatility was determined as standard deviation based on daily logarithmic rates of return (u_i). Volatility in individual years was calculated by means of the formula:

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (u_i - \bar{u})^2}{n-1}} \cdot \sqrt{250}. \quad (2)$$

3. Using WIG index changes as the dynamics of the market.
4. Determining the exercise price at the beginning of each year for every company.
5. The exercise price analysis in reference to the current stock price.

The measure was the relation between the current stock price to the exercise price S/X , where S is the current stock price, X – the exercise price.

The final analysis did not include the extreme values which had been the effect of large stock price fluctuations leading to the volatility range of over 100%. Assuming that the observation covered a given year and a given company, the proportion of extreme values reached 3.9%.

The collective results are presented in Tables 3 and 4. The basic descriptive statistics were determined for the adopted measure S/X .

Table 3. Characteristics of the exercise prices – measures of central tendency

Year	Exercise prices			Relation between the current stock price to the exercise price S/X					
	n	$\frac{n_{(S>X)}}{n}$	$\frac{n_{(S<X)}}{n}$	Average	Average ($S > X$)	Average ($S < X$)	Median	Q _{1.4}	Q _{3.4}
2000	651	100%	0%	1.908	1.908	–	1.908	1.619	2.147
2001	861	86%	14%	2.119	2.340	0.792	2.328	1.707	2.629
2002	805	96%	4%	1.944	1.985	0.930	2.017	1.377	2.371
2003	904	91%	9%	2.630	2.805	0.902	2.532	1.119	3.589
2004	1172	98%	2%	1.556	1.566	0.967	1.427	1.236	1.852
2005	2243	89%	11%	1.335	1.391	0.870	1.258	1.117	1.496
2006	3486	86%	14%	1.727	1.868	0.880	1.485	1.110	2.156
2007	5709	88%	12%	1.989	2.148	0.834	1.635	1.186	2.224
2008	8604	56%	44%	1.293	1.774	0.678	1.081	0.765	1.460
2009	11009	96%	4%	3.240	3.344	0.556	2.914	2.195	3.795
2010	13284	95%	5%	2.174	2.244	0.874	1.835	1.461	2.358
2011	13344	74%	26%	1.293	1.486	0.738	1.228	0.992	1.498
2012	14308	90%	10%	1.835	1.963	0.657	1.838	1.491	2.163
2013	11157	84%	16%	1.741	1.924	0.811	1.542	1.184	1.982
2014*	4379	98%	2%	1.843	1.866	0.798	1.713	1.523	2.025

* Until July 2014

Source: own study.

Table 4. Characteristics of relation between the current stock price to the exercise price S/X – measures of dispersion

Year	Standard deviation	V_{SD}	Semi-interquartile range	V_Q	Min	Max	Range
2000	0.422	22%	0.426	14%	1.026	3.402	2.376
2001	0.736	35%	0.461	20%	0.606	3.577	2.971
2002	0.557	29%	0.497	25%	0.778	3.411	2.633
2003	1.252	48%	1.235	49%	0.801	5.258	4.457
2004	0.402	26%	0.308	22%	0.935	2.579	1.643
2005	0.348	26%	0.190	15%	0.671	2.579	1.907
2006	0.810	47%	0.523	35%	0.700	4.645	3.945
2007	1.351	68%	0.519	32%	0.408	10.87	10.46
2008	1.080	84%	0.348	32%	0.113	9.938	9.825
2009	2.151	66%	0.800	27%	0.143	28.56	28.41
2010	1.583	73%	0.449	24%	0.388	20.26	19.87
2011	0.534	41%	0.253	21%	0.296	4.379	4.084
2012	0.639	35%	0.336	18%	0.102	5.012	4.910
2013	0.960	55%	0.399	26%	0.429	8.346	7.918
2014*	0.549	30%	0.251	15%	0.563	3.863	3.300

* Until July 2014.

Source: own study.

Exercise prices determined by means of the proposed formula were classified as in-the-money options in 86% of cases. In comparison to the practice used by the WSE companies this percentage was much higher. In approximately 50% of programmes with the exercise price fixed above the nominal value the options were out-of-the-money. Particularly large disproportions were seen in the years of the world financial crisis. The programmes that had been incorporated at the time of the bull market often failed to be implemented due to the fact that the intrinsic value of options equals zero. Such a situation affected 70% of the programmes where vesting periods covered the years 2007–2009. It is obvious that if an employee is granted options that are not worth exercise, their participation in the programme is not an incentive for better performance, similarly to the situation when they are entitled to buy stocks at the minimum price, which is a reward rather than an incentive. When the exercise price is a variable value, even in the unfavourable market conditions the options usually remain in-the-money.

The advantage of the proposed formula is that in the majority of cases it pays off to an employee who has met the loyalty and economic criteria and exercises his options. If the programme is to play a truly motivating role, the price at which an employee can buy stocks should not differ much from the market price. The exercise price set as a variable value eliminates the risk of a situation when an employee can buy stocks at a price several dozen times cheaper than their market price. This has been confirmed by the results of this study. On average, the exercise price was a half of the current stock market price. There were sporadic cases (0.31% of the observation) when the S/X rate fell below 10. Taking into account the detailed data, $S/X > 10$ was recorded only in the period of 2007–2010, which was largely due to the turbulence on the financial markets. Difficulties faced by some companies as well as large stock price fluctuations resulted in great discrepancies in the S/X rate in that period.

What is important in the proposed formula is that it takes into account the risk of investing in the company stocks. This risk is described by means of standard deviation. It is worth noting that other measures can be applied as well. Unfortunately, the formula excludes the cases of volatility exceeding 100%. They should be considered in the valuation even though in this study they occurred sporadically. It seems to be the most notable flaw of the proposed formula and it should be eliminated.

Another interesting aspect is the use of the WIG index to indexing the exercise price, which takes into consideration the dynamics of the market. It protects the managers' profits against turbulence on the market and makes the options remain in-the-money. Moreover, it gives limit to unjustifiably high remuneration when market trends are going up. What is important, the formula allows for using other indexes, such as sectoral subindexes that would reflect the situation in that economic sector in which a given company operates. Another proposed solution is the use of a stock

price index, the part of which a given company is, e.g. WIG20, WIG30, mWIG40, WIG50 or WIG250. The modifications of the proposed formula that take into account various indexes will be a subject for further studies.

5. Conclusions

The above considerations confirm that the variable exercise price should be used in the incentive programmes based on the employee stock options. The programmes based on the fixed exercise price, usually correspond to its nominal value, lead to the executives' unreasonably high remuneration, which is controversial for both the general public and the minority stockholders who do not have much say as far as the decisions about granting the options are concerned.

The application of variable exercise prices puts a ceiling over the excessive salaries earned by employees. Tests of the proposed formula have shown that in the majority of ESO programmes the exercise price does not differ much from the market price, which eliminates the problem of the options that are deeply in-the-money and reduces the companies' expenses related to exercising the options. Furthermore such formula protects the company against the costs of the re-setting.

The above analysis shows that in most of the programmes the options at the proposed exercise price have an intrinsic value. It is particularly important in the bear market where, if the exercise price is fixed, the situation when the options are not profitable to managers is frequent despite their good performance. In the adopted solution the out-of-money options accounted for 14%. It should be noted, however, that only in 4% of the cases the stock market price was lower by more than a half than the exercise price.

The proposed variable formula of the exercise price adopted in the incentive programmes based on ESO is not the only one that is applicable. The further studies of the author will focus on various modifications of the formula, which should lead to eliminating its present flaws.

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FORMUŁA CENY WYKONANIA W OPCJACH MENEDŻERSKICH – TESTOWANIE PROPONOWANEGO PODEJŚCIA

Streszczenie: Cena wykonania w odniesieniu do aktualnego kursu akcji decyduje o wysokości wynagrodzenia otrzymanego przez pracownika w ramach programu opcji menedżerskich. Studia literaturowe, przede wszystkim oparte na doświadczeniach amerykańskich, wskazują, że zwykle cena, po jakiej pracownicy mogą nabyć akcje spółki, jest zbliżona do ceny rynkowej notowanej w momencie przyznania opcji. W Polsce cena wykonania odpowiada najczęściej wartości nominalnej akcji, co słusznie wywołuje krytykę programów motywacyjnych opartych na opcjach. Celem artykułu jest przedstawienie zmiennej formuły ceny wykonania w programach motywacyjnych. Rozważania prowadzone w artykule wskazują na zasadność jej stosowania. Analiza przeprowadzona została na podstawie danych odnoszących się do programów motywacyjnych spółek notowanych na GPW w Warszawie. Testowanie proponowanej formuły pokazało, że w większości przypadków cena wykonania nie odbiega znacząco od kursu rynkowego. Eliminuje to problem opcji głęboko *in-the-money* i obniża wysokie koszty firm z tytułu zrealizowanych opcji na akcje.

Słowa kluczowe: opcje menedżerskie, cena wykonania, wynagrodzenie kadry kierowniczej.