‘THE TRUE AND FAIR VIEW’ OF EXECUTIVE STOCK OPTION VALUATION

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Abstract

We compare the market values of executive stock options (ESO) trades with their Black & Scholes (B&S) model values calculated following the major accounting standards, SFAS No.123r and IFRS2. Our results show major underpricing compared to the traditional B&S method values. This should be considered while applying SFAS No.123r and IFRS2 for estimating fair values. Especially time to expiration has major influence on the undervaluation suggesting that the possibility of change in corporate structure lowers the cost of ESOs to shareholders.

Key words: Black & Scholes model, executive stock option, market price, accounting standard, price differential, time to expiration

I. Introduction

In this paper, we use a unique data set to examine the empirical validity of the Black&Scholes (B&S) method to value executive stock options (ESO). The B&S method is one of the methods recognized by major accounting standards for valuation of ESOs in the financial statement; for example, both Statement of Financial Accounting Standard 123r (SFAS No. 123r) and International Financial Reporting Standard 2 (IFRS 2) on share-based payment require companies to expense the value of ESOs during the vesting period. According to Botosan and Plumlee (2001), the median reduction in EPS due to stock option expense is 14 percent. This figure shows that ESOs have a material impact on company results, and the appropriate use of valuation model would be of great importance to estimate the right level of ESO expense.

The use of B&S model for estimating the value of ESO differs from its use for standard stock options. The ESOs have longer times to expiration than standard stock options causing major difficulties in variable estimation. The values of ESOs are also more sensitive to the estimation choices (AAA Financial Accounting Standard Committee, 2005). Prior studies show that the use of B&S model may lead to overestimation of ESO expenses. Theoretical papers claim that the value offered by the B&S model is too high for executive stock options due to undiversified executive portfolios (Meulbroek, 2001; Tian, 2004), and executives' risk aversion (Hall and Murphy, 2002; Tian, 2004). They conclude that the B&S value of ESOs is much higher than their executive values. The difference could be as high as 50 percent of ESOs B&S values.

Empirical studies also support the overvaluation of hypothesis. Huddart and Lang (1996), Carpenter and Yermack (1998) and Bettis et al. (2005) show that early exercise of ESOs is widespread thus indicating a lower value compared to the B&S method values. In particular, ESOs are exercised earlier for the companies with high stock price volatility. These findings supports the claims

presented by the theoretical papers. In addition, Li and Wong (2004) find that the dilutive features of ESOs should be included in the fair value estimates, since otherwise the fair value is overstated by six percent. Currently, both FASB and IFRS have addressed the overvaluation problem of B&S model by requiring companies to use the expected life of the ESO programme rather than its maximum life whereas the dilution is not regarded as an influential factor.

Contrary to other studies, Hodge et al. (2005) in their survey found that risk-averse managers do not appear to discount B&S method values of options. Managers tend to overvalue ESOs compared to other compensation methods, indicating that ESOs are a cheap method for compensating employees.

Besides the early exercise behaviour of company employees, the expected life of the ESO programme could be shorter due to the possibility of changes in corporate structure. In the typical terms of ESO programme, the ESOs expire in the case of merger or demerger. These changes in corporate structure mean the loss of time value in ESOs. The longer the time to expiration the higher is the probability of such changes. For loss-averse investors the loss of time value would be the most unwanted outcome of their investment. The possibility of changes in corporate structure both shortens the expected life of the whole ESO programme and changes the probabilistic outcome structure of ESO in a negative manner for the loss averse investors with short evaluation period (see Benartzi & Thaler, 1995).

In the earlier studies, the value of ESOs has been unobservable and only the components of ESOs like the exercise time, stock volatility, dividend yield and dilution have been observed. In our study, we have an access to the realized trades of ESOs[1]. In Finland, companies may apply to list their ESOs on the Helsinki Stock Exchange (HSE) after these ESOs have been vested. Thereafter,

employees may sell their ESOs on the HSE instead of subscribing shares, and these ESOs are freely traded in the HSE and may be owned by investors, not only by employees.

By using the HSE quotations of ESO trades, we are able to compare the market values of these trades with their B&S model values calculated following the major accounting standards. This comparison offers us a unique opportunity to compare the B&S model values with the market values of ESOs, and explain this price differential. These findings offer an opportunity for the standard setters to define more accurately the values of ESOs included in financial statements.

We use data from the most actively traded ESO companies (14 plans of 6 companies), which represents 98.7 percent of total value of ESO trades on the Helsinki Stock Exchange (HEX). We analyse the pricing of 27,808 trades. Our results show major underpricing compared to the B&S method values. The average underpricing is almost 15 percent with the median underpricing of the ESO plan varying from as low as 0.7 percent and reaching over 50 percent.

Our regression analysis reveals that the underpricing is explained by the time to maturity of ESOs and moneyness of ESOs. One additional year to maturity increases the underpricing by two to six percent indicating the possibility of changes in corporate structure, and one-percent increase in the moneyness of ESOs lowers the underpricing by the value ranging from 0.18 percent up to 0.30 percent. In addition, the discount factor due to the non-transferability of ESOs varies between 3 percent and 5 percent. Further, negative constant of all regressions indicate, that ESOs as a financial security contain uncertainties which make them unattractive for hedging. These findings suggest that the B&S model seriously overvalues the wealth effects of ESOs to shareholders. Therefore, the valuation of ESOs should be considerably lower than that by standard B&S model. This should be considered while applying SFAS No.123r and IFRS2 for estimating fair values.

II. Data description

The first ESO in Finland was issued in February 1988. Since then, the adoption of ESOs in Finland has grown rapidly. Altogether, 298 ESOs have been implemented as of 2002. The proportion of publicly traded companies on the HEX using employee stock option (ESO) plans has increased from 9 percent at the end of 1990 to 83 percent 2001.[2] Although most ESOs have been targeted to top management including key personnel (197), some are targeted to all employees (101) (Figure 1). By the end of 90s, ESOs targeted to all employees had become more popular, though by 2001 and 2002 they already became rare due to increased concern by major owners concerning dilution effects.

Insert Figure 1 here

Typically, stock option plans have either a fixed strike price that is very close to the market value of stock at the grant date or a striking price that increases gradually. In a few cases, the strike price is either set later or indexed. In all cases, the exact price of ESO subscription is known when options vest. The average maturity for options is 5 years and 11 months (min. 2 years, max. 11.5 years), with an average vesting time of 2 years and 4 months (min. 1 month, max. over 6 years). Compared to ESOs in the US, where the average time to expiration used to be 3 years (Kole, 1997), Finnish stock option plans have a longer maturity. The average proportion of new shares issued in ESOs to the total quantity of stock of shares varies between 2.5 percent in the case of ESOs targeted to executives or key personnel and 5.1 percent in the case of ESOs targeted to all employees.

A unique feature of the Finnish market is that employee stock options (commonly referred to as ‘warrants’) are publicly traded on the HEX. The main reason for the beginning of listing ESOs originates from taxation of share subscriptions. For employees, the subscription of ESO based

shares leads to a tax-based risk. The taxes are defined at the time when the ESOs are exercised, but it may take from a few weeks to a few months before the employee can sell the shares and receive cash. The board of directors of a company may decide to apply for listing stock options. The decision is announced as a public stock exchange release. The following release is an example of a standard announcement.

> NOKIA STOCK EXCHANGE ANNOUNCEMENT May 14, 2003
>
> Nokia applies for listing of stock options of the 1999 and 2001 Plans on the main list of the Helsinki Exchanges Nokia Board has resolved to apply for listing of the stock options of the Nokia Stock Option Plan 1999 and 2001 not yet listed on the main list of the Helsinki Exchanges to commence on or about the dates indicated below. The resolution covers the following stock option categories:
>
> 1999B June 1, 2003
>
> 1999C June 1, 2003
>
> …
>
> The stock options will be transferred into the book-entry system prior to the vesting dates of the stock options under each of the respective stock option category.

TietoEnator was the first company to list its executive stock options (Trading code: TIE1VEW198) on December 1, 1998. Since then it has become common practice to list stock options immediately after vesting. As of May 2003, a total of 69 ESOs were listed.

The total sample of this study consists of 53 ESO series issued by Finnish companies and listed on the HEX from the beginning of 2000 to the end of 2002 (detailed descriptive data are available from authors upon request). The options series are ranked according to their total turnover in euros. The total turnover exceeded 3.2 billion euros, of which the three Nokia series were responsible for 94.1 percent. A total of 45,600,977 options were traded in 34,443 transactions.

For further analysis, we selected the most actively traded companies, which have an option turnover exceeding 10 million euros in the three-year period. The companies whose option series were selected based on this criteria were F-Secure [FSC], Nokia [NOK], Perlos [POS] and TietoEnator, each with three series, as well as Sampo [SAM] and UPM-Kymmene [UPM] with one series.

Monthly turnover of the selected option series are described in Table 1. Trading activity is somewhat clustered to specific time periods, reflecting also the interest in the underlying security. In addition, the trades are clustered close to the beginning of the listing, as occurred with NOK1VEW199 and FSC1VEW198. However, trading is very infrequent with POS1VEW197, POS1VEW198, TIEVEW298 and POS1VEW199. A clear departure from clustering and infrequent trading is especially Nokia and also UPM and Sampo, whose options are more evenly traded throughout the year.

Insert Table 1 here.

Three of the ESOs had already been listed prior to our study period, four in 2000, five in 2001 and one in 2002. One ESO, NOK1VEW197, was quoted throughout our study period. Seven ESOs were in-the-money the whole period. Seven ESOs were characterised by time periods when the ESO was out-of-money. One, TIE1VEW199, was consistently without intrinsic value. During our study period, the volatility of the share returns was very high, varying between 111.7 percent (F-Secure in year 2001) and 32.7 percent (UPM in 2001).

Clearly, it can be argued that forecasted volatilities can be lower than the historical ones, and vice versa. We follow the suggestion by IFRS 2 (B25), where they suggest to considering the historical volatility of the share price over the most recent period that is generally commensurate with the expected term of the option.

III. Price differential between the B&S model and market values

The pricing of ESOs is analysed first applying Black's approximation:

C=max (C_T, C_1, C_2),

Where C_T is the Black & Scholes value for a European stock option

C_1 and C_2 are the values of the American stock option at the last cum-dividend day.

We did not correct this approximation with the dilution effect of warrant, since the exercise of the option can be assumed to be anticipated by the market and the dilution is already reflected in the share price at the time ESOs are adopted (Schulz and Trautmann, 1994; Ikäheimo et al., 2004). The dilution of each ESO varies between 0.0 percent (Perlos 1998) and 9.6 percent (Tietoenator 1996).

We calculate the price differential using the following formula (ter Horst and Veld, 2003):

Price differential = [(*Market value – Black&Scholes value*) / *Black&Scholes value*] *100

where *Price differential* is the pricing error in percentage relative to the predicted value of the model

Market value is the price quotation for each trade.

We use intra-day data. When the B&S model value is calculated, the share price quotation is selected from the following trade after the ESO trade has occurred. On average, the time difference is 5 minutes (median 12 seconds).[3] The interest rate for discounting the intrinsic value to the present are estimated using the Euribor interest rate and the Finnish zero-coupon bond yield curve. Using linear interpolation, we obtain all interest rates needed for discounting. Volatility is estimated

using daily logarithmic stock returns from the time period which equals to the contractual life of the option.[4] For the shorter time to expiration of 250 days we used fixed time period of 250 in order to avoid instability of volatility estimates.[5]

Dividends are forecasted by assuming constant dividend per share if the ESO was not dividend protected. In case the company has paid bonus dividends in addition to normal dividends, the proportion of bonus dividend is excluded. Most of the Finnish ESOs are dividend protected. Dividend protection is offered by adjusting the exercise price downwards with the dividend per share paid.

Insert Table 2 here.

The average price differential of all analysed 27,808 trades is –14.8 percent. For each ESO series, the price differential varies between –0.8 percent (median –0.7 percent) to –47.7 percent (median –62.3 percent). The money-weighted price differential is slightly smaller in the most traded ESOs, indicating that larger trades are made at a price closer to the B&S value.

These results indicate that the values for the ESOs predicted by the standard B&S model are too high, and should therefore be corrected downwards to better describe the fair value of ESOs.

IV. Explaining the price differential between the B&S model values and market prices

We use regression analysis to further analyse the price differential between the B&S model values and market values for ESO trades. We try to detect which factors increase or decrease the price differential of ESOs relative to the B&S values. Some factors may clearly offer guidelines for standard setters, how the fair value of ESOs could be estimated for accounting purposes. Others are

more like control variables in nature, and their influence on the price differential should be controlled. For accounting purposes, the following factors are expected to affect the price differential:

1. Moneyness: Tian (2004) shows that executives discount the value of out-of-the-money options much more than in-the-money options. Similarly, ter Horst and Veld (2003) found that price differential is at the lower level when the moneyness increases. Therefore, we argue that the price differential is lower for those ESOs which are deeper in the money. Moneyness is measured by dividing the market price of the share (S) by the exercise price (K) and subtracting 1 (S/K-1).
2. Time to expiration: Due to the possibility of change in corporate structure, longer time to maturity increases the probability of such changes thus decreasing the expected time to maturity of the whole ESO programme. This will decrease the market value of ESOs due to loss of time value. Such an extreme negative event will also lower the expected utility of loss-averse of option holders. In addition, the ESOs with longer time to expiration have higher uncertainty caused by instability of variance over time, increasing the price differential compared to the model estimation (Tian, 2004).
3. Recent listing of stock options: In a recent analysis of ESO valuation, Meulbroek (2001), Hall and Murphy (2002) and Tian (2004) find that ESOs are less valuable for managers than for diversified shareholders. Therefore, at the time when ESOs are listed, supply pressures among the employees can lead to higher price differential. In addition, this supply pressure can also be increased by the liquidity needs of employees. We thus expect to find a higher price differential for recently listed ESOs and use a dummy variable for all trades executed during the first ten days after the listing.

4. Recent interim report: Prior to an interim report announcement, insiders are not allowed to trade with company shares or ESOs. Therefore, immediately after the interim report announcement, the increased supply of ESOs can be expected to increase the potential level of the price differential. We use dummy variable for all trades executed during the first ten days after the interim report announcement.

We also expect to find a negative constant, which indicates a permanent price differential between the B&S model values and the market value of ESO trades. This constant price differential is caused by the continuous supply of ESOs by company managers with undiversified portfolio holdings. We do not expect this price differential to be fully eliminated by investors with a hedge strategy, since hedging is costly and the time to expiration of the ESOs is uncertain. It could be much shorter than expressed in the terms of the programme due mergers and other company restructuring. This is true for both cash flow matching and delta hedging (see Green and Figlewski, 1999). The only profitable hedging (or rather arbitrage) which is certain is based on the immediate use of ESO. Based on our results, ESOs are traded even below their intrinsic value indicating that such an arbitrage really happens.

Earlier studies also suggest that we should control for the effects of the following factors:

1. Liquidity of ESO: According to findings by Ackert and Tian (2001) and Kamara and Miller (1995), the level of the price differential is affected by the liquidity of options. The higher the liquidity, the lower the price differential. We measure liquidity with the natural logarithm of the daily trades in euros for the same day as each ESO trade is executed.
2. The size of the ESO trade: The sales of a large amount of security in the continuous trading may affect price pressures, especially if the security is illiquid. On the other hand, in the case of derivatives, larger trades offer better opportunities for arbitrage,

thus decreasing the price differential (Cho and Engle, 1999). The size of the ESO trade is measured with the natural logarithm of trade in euros.

The regression results are reported in Table 3. The constant of our regression shows that if all other variables were zero, the market values for ESO trades would be 46.16 percent lower than those predicted by the standard B&S model.

Insert Table 3 here

Moneyness is negatively related to underpricing. This result is consistent with earlier findings, e.g. ter Horst and Veld (2003), from the warrant market. Our results indicate that a one-percent increase in moneyness can decrease the price differential by 0.24 percent. Underpricing increases with increasing time remaining until maturity. This finding suggests that neither executives nor other investors may fully appreciate the time value of their options. The regression coefficient of -4.17 indicates that the underpricing of ESOs relative to the B&S model increases by 4.17 percent per year.

Dummy variables for recent listings and recent interim reports receive negative regression coefficients as expected. In particular, executive stock option underpricing is larger immediately after the listing of options than that predicted by the B&S model. The underpricing is 2.88 percent higher for trades with recently listed ESOs.

Both control variables show significant influence on the price differential. The coefficient of liquidity is positive as expected, i.e., underpricing decreases with increasing liquidity. This finding is consistent with observations by Ackert and Tian (2001) and Kamara and Miller (1995) from options markets. The size of the trade lowers the underpricing compared to the B&S model values.

Larger trades are more appealing for arbitrageurs and can thus be expected to ‘drive’ the prices closer to their theoretical levels.

As a check for robustness, we made the same regression for ESOs without Nokia ESOs and with Nokia ESOs alone, since Nokia represents most of the ESO trades. The results without Nokia are reported in Table 6 and those with Nokia alone in Table 5.[6]

Insert Table 4 here

Insert Table 5 here

These results show that all variables are significant and have the same sign as in our original regression. From the accounting viewpoint, the major differences are in the size of the regression coefficients. The coefficient of moneyness is close to the total sample coefficent, 0.30 percent for the sample without Nokia, and 0.18 percent for Nokia alone. The yearly coefficient of time to maturity is –6.34 percent for the sample without Nokia and –2.17 percent for Nokia alone. In addition, both samples seem to be affected by the recent listing of ESOs. The coefficient is –3.23 percent for the sample without Nokia and –1.89 percent for Nokia alone. The only exception in our analysis is the recent interim report for the sample without Nokia, which shows a positive but insignificant coefficient of 0.13 percent. For the Nokia sample, this coefficient is, as expected, negative with a value of –1.76 percent. The constant of both models is negative but smaller than that in our total sample. For the sample without Nokia, the constant is –36.90 percent, and with Nokia alone -39.00 percent.

To conclude, the market values of ESOs are clearly below the values predicted by the standard B&S model. Therefore, in order to obtain a fair value for ESOs in accounting, B&S model values need to be somehow corrected:

- There should be a constant correction factor of over –25 percent (constant plus recent listing coefficient). This would correct the hegding costs and the riskiness of hedging when time to expiration is uncertain.
- The time to maturity should be considered with a correction factor of about –4 percent per year. This includes the danger of loss of time value due to the possibility of changes in corporate structure and the loss aversion of investors.
- The moneyness of ESOs should be included in the corrections. Our results show that a one-percent increase in the moneyness requires a correction factor of approximately 0.2 percent. However, at-the-money ESOs do not appear to require any correction.

We acknowledge that these correction factors are rather illustrative, model specific and cannot be directly employed in the countries with different market setting.[7] One may also note Mozes (1995) which suggests that there obviously are estimation issues that apply equally to ESOs and other long-lived options. For example, such parameters as volatility and dividends are unlikely to remain stable over long periods of time.

V. Summary

In our paper, we use data from the most actively traded ESOs (14 plans from 6 companies), representing 98.7 percent of the total value of ESO trades at the Helsinki Stock Exchange. We analyse the pricing of 27,808 trades. Our results show serious price differential compared to the standard B&S model, with the price differential averaging –14.8 percent. This shows that the standard B&S model clearly overstates the value of ESOs which should be expensed by companies. We also find that the median price differential varies between -0.7 percent and -62.3 percent, indicating that the undervaluation of ESOs compared to the B&S model is not particularly constant across ESOs.

Using regression analysis, we explain potential reasons for the price differential. Regression analysis also reveals the means for correcting the standard B&S model values to better reflect the true values of ESOs. We also show that the underpricing is higher, the longer the time to the ESO's maturity or when the ESO plan is recently vested. Underpricing is, however, lower when the size of the trade is larger, the daily trading volume is higher, the ESO is in-the-money, or when the interim report is recently published. These results are in line with the models by Meulbroek (2001), Hall and Murphy (2002) and Tian (2004).

These findings suggest that the valuation of ESOs should be considerably lower the standard B&S model recognized by the FAS No. 123r and IFRS 2. The use of B&S model as such leads to ESO expenses too high compared to the arm's length prices. Therefore, the standard B&S model does not represent either true or a fair view of the financial statement for company valuation For reasons of undiversification of executives and difficulties to hegde by institutional investors, there should be a constant discount factor of over 25 percent. Furthermore, an annual discount of about 4 percent should be considered to compensate for the possibility of change in corporate structure leading to the total loss of time value, and to compensate uncertainty in volatility. An additional 0.2 percent increase should be counted for every one-percent increase in moneyness.

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Table 1. Monthly turnover of the 14 most liquid option series.

Monthly turnover, 1000 eur														
	NOK1VEW197	NOK1VEW195	NOK1VEW199	POS1VEW197	SAMASEW198	TIE1VEW198	FSC1VEW198	UPM1VEW198	FSC1VEW298	POS1VEW198	TIE1VEW298	POS1VEW199	FSC1VEW398	TIE1VEW199
01 / 2000	55,630	98,493	0	0	0	1,303	0	0	0	0	0	0	0	0
02 / 2000	61,821	323,185	0	0	0	1,990	0	0	0	0	0	0	0	0
03 / 2000	44,087	81,900	0	0	0	620	0	0	0	0	0	0	0	0
04 / 2000	44,755	73,196	0	715	0	7	10,295	0	0	0	0	0	0	0
05 / 2000	31,920	83,753	0	2,544	1,193	0	4,151	0	0	0	0	0	0	0
06 / 2000	55,965	84,469	0	20,235	716	0	4,975	0	0	500	0	0	0	0
07 / 2000	29,326	12,521	0	0	384	0	745	0	0	0	0	0	0	0
08 / 2000	4,859	8,329	0	0	519	0	319	0	0	0	0	0	0	0
09 / 2000	3,523	9,270	0	0	1,383	35	1,491	0	0	0	0	0	0	0
10 / 2000	41,547	44,833	0	31	226	12	91	0	0	0	0	0	0	0
11 / 2000	18,240	29,613	0	0	1,821	7	442	0	0	0	0	0	0	0
12 / 2000	58,165	45,805	0	32	951	2,637	409	0	0	0	0	0	0	0
01 / 2001	5,956	32,192	0	0	2,380	2,130	279	0	0	0	0	0	0	0
02 / 2001	2,517	0	0	0	2,457	1,602	113	0	0	0	0	0	0	0
03 / 2001	3,994	0	0	321	2,644	224	7	0	0	79	0	0	0	0
04 / 2001	11,086	0	208,678	452	2,548	3,164	40	780	233	0	0	0	0	0
05 / 2001	13,470	0	89,221	6,305	3,048	2,884	19	1,706	197	359	0	0	0	0
06 / 2001	3,513	0	10,748	39	946	87	29	513	66	0	101	38	0	0
07 / 2001	3,488	0	3,450	0	432	52	3	207	21	0	26	0	0	0
08 / 2001	2,174	0	1,560	0	131	832	2	1,451	30	0	15	1	0	0
09 / 2001	276	0	1,171	0	238	167	2	1,070	57	0	9	0	0	0
10 / 2001	8,646	0	3,134	193	899	1,423	25	282	118	0	35	0	0	0
11 / 2001	311,102	0	10,678	952	422	3,705	5	2,536	58	0	89	211	0	0
12 / 2001	111,232	0	8,813	300	477	3,283	12	1,098	53	0	115	0	0	0
01 / 2002	166,797	0	11,289	0	278	3,618	69	2,728	118	0	108	5	0	0
02 / 2002	70,387	0	3,991	0	373	0	29	3,087	91	0	48	5	0	0
03 / 2002	66,983	0	15,169	229	1,313	0	88	3,728	117	0	52	2	0	0
04 / 2002	44,853	0	2,860	850	2,086	0	5	52	50	0	24	0	117	0
05 / 2002	19,832	0	765	0	1,891	0	9	629	21	85	21	3	37	26
06 / 2002	15,608	0	2,807	1	462	0	4	496	0	0	12	2	32	4
07 / 2002	12,499	0	1,786	0	491	0	17	65	8	0	19	0	4	5
08 / 2002	32,614	0	1,444	0	300	0	11	94	19	0	3	0	8	2
09 / 2002	40,363	0	709	0	157	0	2	645	2	0	2	0	1	2
10 / 2002	171,110	0	2,957	140	161	0	6	1,303	0	0	2	0	0	1
11 / 2002	86,855	0	4,703	1,356	712	0	22	405	19	63	6	1	34	1
12 / 2002	62,853	0	1,313	94	312	0	69	40	35	0	7	3	17	3
SUM	1,718,047	927,558	387,244	34,790	32,350	29,781	23,784	22,914	1,311	1,086	696	270	249	46

Table 2. Analysis of stock option pricing relative to the Black & Scholes value.

	Number of trades 2000-2002	Turnover 1000 eur 2000-2002	Average price differential 2000-2002	Median price differential 2000-2002	Money weighted price differential 2000-2002
FSC1VEW198	737	23,736	-1.5 %	-1.6 %	-1.3 %
FSC1VEW298	303	1,311	-12.3 %	-11.4 %	-13.0 %
FSC1VEW398	74	249	-11.3 %	-11.1 %	-11.8 %
NOK1VEW195	854	932,234	-0.8 %	-0.7 %	-0.8 %
NOK1VEW197	9,568	1,694,424	-1.0 %	-0.8 %	-0.9 %
NOK1VEW199	7,611	379,458	-15.5 %	-12.5 %	-10.2 %
POS1VEW197	165	34,671	-2.4 %	-2.7 %	-1.9 %
POS1VEW198	21	1,086	-12.1 %	-11.7 %	-7.8 %
POS1VEW199	43	270	-46.2 %	-45.8 %	-37.5 %
SAMASEW198	5,761	32,353	-38.3 %	-38.1 %	-36.8 %
TIE1VEW198	1,580	29,781	-2.9 %	-2.6 %	-2.5 %
TIE1VEW199	138	46	-69.4 %	-76.9 %	-71.4 %
TIE1VEW298	436	696	-42.2 %	-53.2 %	-53.2 %
UPM1VEW198	519	22,914	-20.6 %	-19.3 %	-21.5 %

Table 3. This table presents the regression analysis of the mispricing of ESO's with percentage price differential relative to B&S value as the dependent variable for the **total sample**. *Moneyness* is the ratio of the stock price and the exercise price minus one. The moneyness of out-of-the-money options is negative. Time to expiration (*Time*) is measured in years to the time period when it is rational to exercise options. *Listing* is a dummy variable with a value of 1 if the trade is executed within ten days after the listing. *Interim report* is a dummy variable with a value of 1 if the trade is executed within ten days after the interim report announcement. *Liquidity* is measured by the natural logarithm of daily turnover for an option. The trade size (*Size*) is measured as the natural logarithm of the trade.

Variable	expected sign	coefficient	st.dev.	t-value
Interc.		-46.16	0.45	-103.4***
Moneyness	+	0.24	0.00	49.3***
Time	-	-4.17	0.05	-87.1***
Listing	-	-2.88	0.22	-13.2***
Interim report	-	-1.66	0.16	-10.6***
Liquidity	+	5.61	0.08	69.8***
Size	+/-	1.75	0.10	17.3***
N	27.808			
Adjusted R^2	0.608			

*** =significant at 1% level, **=significant at 5% level, *=significant at 10% level

Table 4. This table presents the regression analysis of the mispricing of ESOs with percentage price differential relative to B&S value as the dependent variable **without Nokia ESOs**. *Moneyness* is the ratio of the stock price and the exercise price minus one. The moneyness of out-of-the-money options is negative. Time to expiration (*Time*) is measured in years to the time period when it is rational to exercise options. *Listing* is a dummy variable with a value of 1 if the trade is executed within ten days after the listing. *Interim report* is a dummy variable with a value of 1 if the trade is executed within ten days after the interim report announcement. *Liquidity* is measured by the natural logarithm of daily turnover for an option. The trade size (*Size*) is measured as the natural logarithm of the trade.

Variable	expected sign	coefficient	st.dev.	t-value
Interc.		-36.90	1.03	-35.8***
Moneyness	+	0.30	0.01	41.1***
Time	-	-6.34	0.11	-59.8***
Listing	-	-3.23	0.51	-6.3***
Interim report	-	0.13	0.37	0.4
Liquidity	+	2.60	0.23	11.4***
Size	+/-	4.00	0.27	14.8***
N	9.775			
Adjusted R^2	0.450			

*** =significant at 1% level, **=significant at 5% level, *=significant at 10% level

Table 5. This table presents the regression analysis of the mispricing of ESO's with percentage price differential relative to B&S value as the dependent variable **with Nokia ESOs alone**. *Moneyness* is the ratio of the stock price and the exercise price minus one. The moneyness of out-of-the-money options is negative. Time to expiration (*Time*) is measured in years to the time period when it is rational to exercise options. *Listing* is a dummy variable with a value of 1 if the trade is executed within ten days after the listing. *Interim report* is a dummy variable with a value of 1 if the trade is executed within ten days after the interim report announcement. *Liquidity* is measured by the natural logarithm of daily turnover for an option. The trade size (*Size*) is measured as the natural logarithm of the trade.

Variable	expected sign	coefficient	st.dev.	t-value
Interc.		-39.00	0.35	-111.2***
Moneyness	+	0.18	0.01	25.0***
Time	-	-2.17	0.03	-65.7***
Listing	-	-1.89	0.14	-13.8***
Interim report	-	-1.76	0.10	-18.5***
Liquidity	+	4.55	0.06	80.7***
Size	+/-	1.35	0.06	21.9***
N	18.032			
Adjusted R^2	0.662			

*** =significant at 1% level, **=significant at 5% level, *=significant at 10% level

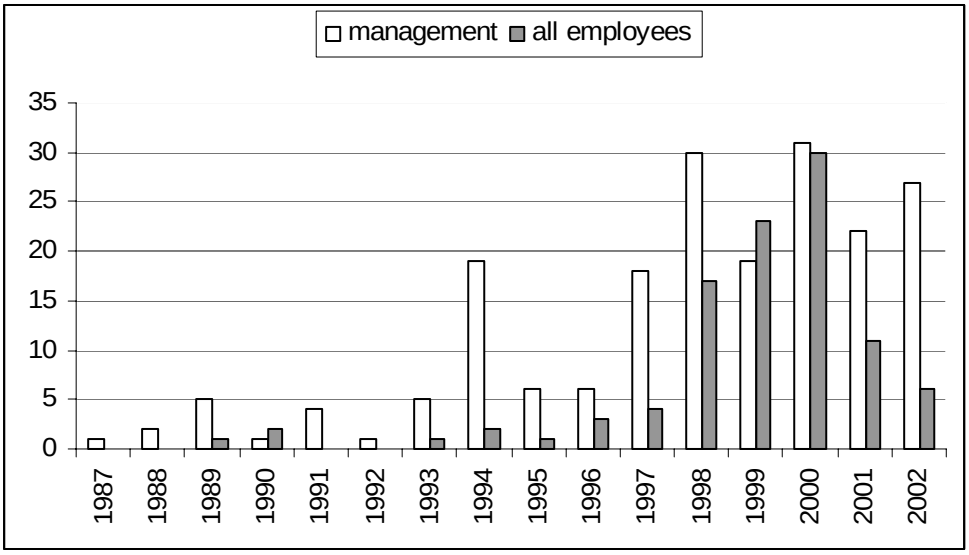

Figure 1. The number of stock option plans, issued at the annual level and grouped according to the target group (management including key personnel and all employees) (Jones et al., 2004)

[1] OTC data would be available on the Microsoft ESOs, where J.P. Morgan purchases employee options. The price level shows a discount of 80 % relative to the value of similar traded options (Bettis et al., 2005).

[2] Similar trends could be found in the US during the 1980s (Aboody 1996), in the UK in the late 1980s (Buck & Bruce 1991), in Canada in early 1990s (Klassen & Mawani 2000), and in Germany in the late 1990s (Winter 1999).

[3] If the following trade with shares takes place on the following day, we selected the share price based on the previous trade prior to the ESO trade.

[4] As a robustness check, we also used a fixed time period of 250 days prior to each ESO trade for volatility estimation. Volatility figures were slightly different, in three companies and nine ESOs, the fixed 250 day volatility resulted in higher volatilities and in another three companies and five ESOs they were lower. All the regression results were qualitatively the same irrespective of the volatility estimation choice.

[5] No mean-reversion tendency is considered since all companies have been listed for a longer time period.

[6] We also used fixed 250 days volatility estimation period to control the influence of volatility estimations. All signs and significance levels remains practically the same, and only minor changes exist in the multipliers. The major difference is in the size of constant. All constants are smaller when using fixed 250 days for volatility estimation, and the difference varies between 16.52 and 13.96 percent points.

[7] Such differences are e.g. the probability of changes in corporate structures, taxation of ESOs and policies on whether executive can hold the options when leaving the company. In Finland, executives leaving the company typically can hold their ESOs after vesting.