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The Winning Probability of Selling Option on Crude Oil West Texas Intermediate

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Abstract

Nescinece of the winning probability of selling option on crude oil West Texas Intermediate (WTI) may be one cause of lack of research on selling options whereas option on WTI trading on NYMEX now becomes one of the largest trading in the world. The study of selling option is much less than buying option, so that people are less familiar to selling option performance probability. This study aims to analyze winning probability of the monthly return of selling option on WTI. The monthly return of selling option premium data was analyzed by the Black Scholes Option Pricing Method using daily WTI price data ranging from April 1984 to May 2017. It employs the runs test as non parametric statistical and one-sample proportion test as parametric statistical method. Empirical results indicate that winning probability of selling option on WTI at the far out of the money strikes is better than at the near the money position strikes.

Keywords: Selling option, WTI, probability, randomness, proportion

1. Introduction

The crude oil West Texas Intermediate (WTI) is the main commodity that becomes one of the macroeconomic indicators. WTI is traded on the New York Merchantile Exchange (NYMEX) through futures or option transactions. Since 1997, the option transaction has increased significantly to reach more than 100,000 contracts per day today. This transaction shows that WTI commodity is one of the world's macroeconomic indicators (Behmiri and Manso, 2013).

Option study has been done a lot, but the study generally discussed about buying option side. There are about 60 studies abroad and about fifty nine studies in Indonesia discussing buying option. Lakonishok et al. (2004) and Bhattacharya (1987) and others explain that the expiration strategy on buying option can be applied to the treasury bond. On the other hands, study on selling option is still rarely done. About 9 studies abroad and one study in Indonesia have discussed selling option. Some of these studies are Berkovich and Shachmurove (2013), Franke et al. (1998), Long (1973), and Asianto (2014), whereas the option deals on the NYMEX exchanges are considered large. This indicates that there is a study gap between buying option and selling option, so that people do not understand the winning probability and performance of selling option on WTI.

This study aims to find winning probability of selling option trading. We used runs test for non randomness as a non-parametric method and we checked it out to reconfirmed the result with one-sample proportion t-test as a parametric method. We used daily WTI price data ranging from April 1984 to May 2017. The data were analyzed by Black-Scholes Option Pricing Model to become the monthly return of selling option on WTI premium. We chose 24 strike positions of strike 1 to 12 and strike -1 to -12. We used binomial method. Each positive return is given the symbol number 1, otherwise the negative is given the symbol number 0. We compare winning probability at each strike position using runs test for non-randomness and one-sample proportion t-test method.

Empirical results indicate that during the study period, winning probability of the far out of the money (FOTM) strikes are better than probability of the near the money (NTM) strikes. This study are expected to advance the science of financial and investment of commodities, and as an input for the Otoritas Jasa Keuangan (OJK) as financial services authority in the development of derivatives and futures markets in Indonesia.

The rest of this paper was organized as follows. Next section we explained literature review related this study. In the research methodology section we explained the research method and the data analysis. Finallly we presented the results, discussion and conclusions of the research.

2. Literature Review

2.1 Option

According to McMillan (2004), the U.S. option is the most active and the largest option transaction in the world. This margin value of option on WTI is relatively low with large multiplication value. There are four basic option strategies, namely buy call option, sell call option, buy put option and sell put option.

Buy call option (long call option) on WTI is option contract which has rights (not obligation) to buy underlying WTI at strike price before expiry date. Buy put option (long put option) on WTI is option contract having rights (not obligation) to sell underlying WTI at strike price before expiry date. The holder of this contract is called the option holder. Sell call option (short call option) or sell put option (short put option) are a writer of option contract. The option writer has an obligation to be excersiced if their margin tradings are out of the limits (Cordier and Gross, 2009).

According to Lee et al. (2016), the most famous option pricing model is the Black–Scholes Option Pricing Model (BSOPM). Black and Scholes and Merton in 1973 have used stochastic Ito calculus to derive an option pricing model. We used BSOPM to analyze the WTI price data became the monthly option premium. The BSOPM equations are as follows.

$$C = S.N(d_1) - X.e^{-rt}.N(d_2) \quad \ldots(1) \qquad P = X.e^{-rt}.N(-d_2) - S.N(-d_1) \quad \ldots(2)$$

$$d_1 = \frac{ln\left(S/X\right) + (r + 0.5s^2)(t)}{s\sqrt{t}} \quad \ldots(3) \qquad d_2 = d_1 - s.\sqrt{t} \quad \ldots(4)$$

Where, C is call option premium, P is put option premium, S is current WTI price, X is WTI strike price, r is risk free rate, t is expiry time (year), N is cumulative standard normal distribution, ε is exponential term, ln is natural logarithm and s is standard deviation.

Selling options have been observed in previous studies. Murray (2012) developed a profitable method of profit margin trading for selling option. Asianto (2014) stated that the risk of selling option at FOTM strikes is lower than at NTM strikes, so that the selection of strikes in the FOTM position is preferred than NTM. Franke et al. (1998) explained that low risk investors prefered selling option, while high risk investors tended to prefer buying option. Summa and Lubow (2002) described more than 80 percent of option on S&P 500 futures expired worthless in the period January 3, 1997 to December 31, 1999. The performance of selling option was better than buying option. Asianto (2014) explained that selling option on WTI at FOTM strikes in period July 2013 to February 2014 had a winning probability of 83.3 percent, so that it was better than buying option. Courdier and Gross (2009) states that selling options on futures at FOTM strikes if done in the right way will have a higher chance than NTM strikes. Wolfinger (2014) and Zerenner (2008) explained if the selling option is done in a conservative way, it will get better probability than buying option.

2.2 Winning Probability

According to Meester (2008:1), probability is the proportion of the possibility of occurrence of an event. The probability ranges from 0 to 1, where 0 is impossibility and 1 is certainty. The higher the probability of an event, the more possible it will occur. When we measure winning probability, we have K sample space of win and loss. The number of win is W, then the relative frequency of wins is equal to W/K. Otherwize the number of loss is L, then the relative frequency of loss is equal to L/K. The equation is described as follows.

$$\frac{W}{K} + \frac{L}{K} = 1 \quad \ldots(5)$$

The probabilities of win and loss should add up to one. The two possible outcomes form the set K = {win, loss}, and we can formalise the assignment of probabilities by defining a function p:K→ [0, 1] given by p(win) = p(loss) = 1/2.

The winning probability of several strike positions need to be analyzed. Studies of winning probability analysis were analyzed by runs test as non-parametric method. Essen and Wooders (2014) conducted winning probability analysis of game using runs test method. Coulomb and Sangnier (2012) analyzed the winning probability of the 2007 French presidential election associated with the company's abnormal return using runs test method. Martínez (2011) examined the probability of winning of the game because of a new coach in sport using the test runs method. Eliaz and Rubinstein (2011) examined games and economic behavior related to winning probability on the finitely repeated matching game pennies using the runs test method. Hsu et al. (2004) examined the winning probability in tennis, including male, female and junior matches using the runs test method.

2.3 Runs test

The use of runs tests were also done in several studies to measure randomness data. Sule et al. (2015) reveal that changes in stock price were random and suggests that the Nigerian stock exchange is efficient in the weak form. Owido et al. (2014) explained that the K-S and Runs test confirm that the data is not normally distributed which implies inefficiency in the weak form. This signifies Nairobi Securities Exchange market inefficiency of the weak form. Kariuki et al (2015) tested the efficiency of the market using the Non-parametric runs test to uncover any independency of returns. Rayhorn (2014) examined the positive and negative returns' runs from 1926-2013 to analyze the issue from historical perspective using runs test for randomness method. The result showed that buy and hold investors had most years were up (73%) for these data. Hentati-Kaffei and de Peretti (2014) used runs test method for tested the randomness of large sample of hedge funds from the HFR universe over January 2000 to December 2012. The result was a low percentage displays persistence in their performance measured by their ability to produce clusters. Gill et al. (2014) used runs test method to analyze the randomness of the high repeat content of Sunflower genome. The result suggested that the sunflower genome is more than 78% repetitive. Akber and Muhammad (2014) attempted to seek evidence for weak-form of market efficiency for KSE 100 Index using runs test method to analyze the randomness. Overall KSE 100 Index was to be weak-form inefficient. Companies return series from KSE 30 Index were found to be more random than companies return series from KSE 100 Index. Kumar and Mishra (2013) used runs test to analyze the randomness of the return supporting the weak form of efficiency in the market. The results reveal that Indian Stock Market (CNX Nifty) was a weak form of efficiency. Haque et al. (2011) used runs test for randomness and found that the Pakistani stock prices were not weak form efficient.

Khairiah (2009) used runs test for randomness to analyze the effect of corporate stock split actions to the abnormal return of stock. The results showed that stock prices were not random and capital markets were inefficient half strong form. Pramantya (2017) used runs test to analyze the rundomness of limestone data as an alternative to cattle feed mix. The results showed that the data had spread randomly within the control limits. Sriwidadi (2011) explained that the sales force in selling a new product of PT Merapi Utama Pharma company data was randomed.

Based on several studies using runs test for randomness, this study analyzed the probability of selling option using the runs test as a non-parametric method. According to Walpole (1995), the runs test divided data, both quantitative and qualitative data, into two non-intersecting groups, such as positive or negative, profit and loss, black or white colour, male or female, good or defective, image or number, and more. This test is used to analyze whether the observation (sample) was taken at random. Runs tests are a sequence of the same result, preceeded and followed by different results. The data is assumed to have been taken at random, so that the null hypothesis H_0 that the observations have been taken randomly. The runs tests for checking randomness are based on random variables r, ie. the number of total runs in the experiment on our sample. We calculate runs test for randomness using equation as follows.

$$Z = \frac{r - \mu_r}{\sigma_r} \quad \ldots(6)$$

Where, Z is runs test, r is random variable, μ_r is expected runs, σ_r is standard deviation of μ.

2.4 Test of proportion

We also used the parametric test to confirm non-parametric test results. We used test of proportion with one-sample proportion t-test method. Several previous studies also used this method. Achchuthan and Kajananthan (2013) revealed that, there is no significant mean different between the firm performance among corporate governance practices as board leadership structure, board committees, board meetings and proportion of non executive directors. Uzoma and Chukwu (2015) used statistic proportion test (x2) Chi-square was used in testing the the hypotheses. The research findings show that significant relationships exist between bank-service delivery and Consumers choice of Banks. Sinha et al. (2008) used one-sample proportion test with vague prior in predictive approach. Bae (2016) used test of proportion in a dissertation to to investigate the influence of occupant behavior-related input variables on the optimization process. Harniati (2007) employed test of proportion in her dissertation to analyze typology and characteristics of Indonesian poverty and its vulnerability based on agroecosystem. Lee (2009) investigated the strategies elementary and middle school principals using one-sample proportion test in a dissertation analysis.

According to Walpole (1995) the proportion p in a binomial sample $\hat{P} = X/n$, where X is the number of successes in n replication. The proportion of sample will be used as the expected point value for the parameter p. If the unknown proportion p is not too close to 0 or 1, it can create a confidence interval for p by studying the distribution of samples for P, which is a multiple of X random variable. For large n, we calculate the value of Z as follows.

$$Z = \frac{P - p}{\sqrt{(p.q)/n}} \qquad \text{…(7)}$$

Where, Z is proportion test, P is population of sample data, p is proportion of binom, q is equal to (1 – p) and n is sample data.

For the random sample of n size, we can calculate the proportion for $\hat{p} = x/n$, so that a 100% confidence interval (1 - α) for the following p is obtained. The method of determining the confidence interval for the binomial p parameter can also be applied when we use the binomial distribution to approach the hypergeometric distribution, meaning that when n is relatively low compared to N.

3. Research Methodology

3.1 Overview

We used non-parametric and parametric methods to analyze winning probability selling options on WTI. Our return data were analyzed by BSOPM. A description of the research method and the compilation of data analysis is presented below.

3.2 Research Method

1. **Run test for randomness (non-parametric) –** Some steps in the runs test for large samples more than 20 samples are as follows.
   a. Determining H_0 and H_1
      We may analyze the randomness of data sequences. If the number of runs is higher or less than our expectation, it means that the data is not random, then the hypothesis H_0 is rejected.

      H_0 : the data is random.
      H_1 : the data is not random
   b. Determine the level of significance (α) and determining decisions.
2. **One-sample proportion t-test (parametric) –** Some steps in the test of proportion on a one-sample proportion t-test method are as follows.
   a. Determining H_0 and H_1
      If proportion is higher than 50%, it means that probability of win is higher than loss.

      H_0: Proportion = 0.50

      H_1: Proportion > 0.50
   b. Determine the level of significance (α) and determining decisions.

3.3 Data Analysis

In this study we calculate the sell call option premium (C) in each strike by using BSOPM at the beginning of each month. After the investment goes for 1 month expiration period, we calculate the return of selling option with the following stages.

$$\Delta WTI_{call} = S - X$$

$$\text{If } \Delta WTI_{call} \leq 0 \rightarrow R_{call} = C \qquad \text{…(8)}$$

$$\text{If } \Delta WTI_{call} \geq 0 \rightarrow R_{call} = C - \Delta WTI_{call} \qquad \text{…(9)}$$

Where, ΔWTI_{call} is the WTI price difference between the WTI market price (S) minus the WTI strike price (X). If ΔWTI_{call} is lower or equal to zero, then the return of sell call option (R_{call}) is equal to the call option premium(C). If ΔWTI_{call} is higher than zero, then the return of sell call option (R_{call}) is equal to the call option premium (C) minus ΔWTI_{call}.

We also calculate the put option premium (P) in each strike by using BSOPM at the beginning of each month. After the investment goes for 1 month expiration period, we calculate the return of selling put option with the following stages.

$$\Delta WTI_{put} = X - S$$

$$\text{If } \Delta WTI_{put} \leq 0 \rightarrow R_{put} = P \qquad \text{...(10)}$$

$$\text{If } \Delta WTI_{put} \geq 0 \rightarrow R_{put} = P - \Delta WTI_{put} \qquad \text{...(11)}$$

Where, ΔWTI_{put} is the WTI price difference between WTI strike price (X) minus the WTI market price (S). If ΔWTI_{put} is lower or equal to zero, then the return of sell put option (R_{put}) is equal to the put option premium (P). If ΔWTI_{put} is higher than zero, then the return of the sell put option (R_{put}) is equal to the put option premium (P) minus ΔWTI_{put}.

To compare the winning probability required the return premium of each strike of selling option from the crude oil WTI price data analyzed using BSOPM. In this analysis we carried out the followings.

a. We used monthly WTI price ranging from April 1984 to May 2017.
b. We analyzed the monthly option premium from daily WTI price using BSOPM.
c. We chose 24 strike positions of strike 1 to 12 and strike -1 to -12.
d. We calculated the monthly return of selling option at each strike ranging from April 1984 to May 2017. We have 24 strikes contained each monthly return series data.
e. If the return of selling option is negative value, then we give the symbol number of 0. Otherwise, If it is positive value, then we give the symbol number of 1.
f. We analyzed the winning probability of each return series data at each strike.

4. Result

4.1 Winning probability at FOTM strikes are much higher than at NTM

The win-loss recapitulation of all monthly tradings are showed in Table 1.

Table 1. Winning probability at FOTM strikes are better than at NTM

strike	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12
win	390	387	382	376	370	366	360	356	345	330	297	239	71	170	232	267	305	328	345	357	368	376	380	385
loss	7	10	15	21	27	31	37	41	52	67	100	158	326	227	165	130	92	69	52	40	29	21	17	12
total	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397
Winning Probability of selling option on WTI (%)																								
win	98	97	96	95	93	92	91	90	87	83	75	60	18	43	58	67	77	83	87	90	93	95	96	97
loss	2	3	4	5	7	8	9	10	13	17	25	40	82	57	42	33	23	17	13	10	7	5	4	3

The monthly selling option return analysis are summarized in Table 1. The values are shown from strike 1 to 12 and from strike -1 to -12. Win and loss values are summarized to each strike, then the winning probabilities are calculated on each strike. Strike 1, 2, -1, and -2 are strikes at NTM. Strike 9, 10, -9, and -10 are strikes at FOTM position.

Table 1 explains that the winning value of strike 1 of 71 continues to increase to strike 12 of 385. Similarly, the winning value of the strike -1 of 239 increases steadily to the strike -12 of 390. The winning probability of strike 1 of 18% continues to increase to strike 12 of 97 %. Similarly, the winning probability of the strike -1 of 60% increases steadily to the strike -12 of 98%. We find that winning probability of selling option on WTI at strikes FOTM are reach 93 % and above. They have better probability than strikes at NTM.

Table 1 explains that the loss value of strike 1 of 326 continues to decrease to strike 12 of 12. Similarly, the loss value of the strike -1 of 158 decreases steadily to the strike -12 of 7. The loss probability of strike 1 of maximum 82% continues to decrease to strike 12 of 3 %. Similarly, the loss probability of the strike -1 of maximum 40% decreases steadily to the strike -12 of 2%. We find that loss probability of selling option on WTI at strikes at NTM are reach at maximum 80 % and below.

The win-loss of all monthly tradings are showed in Figure 1 as follows.

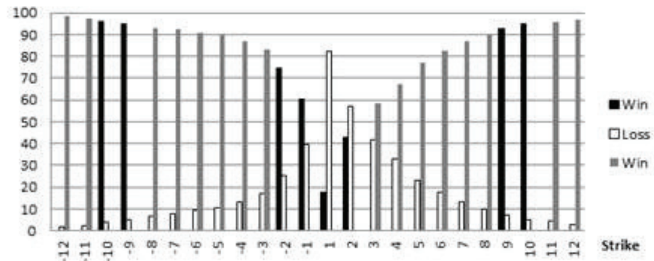

Figure 1. Winning probability of selling option on WTI

Figure 1 explains the winning probability of selling option on WTI at strike 1 of 18% continues to increase to strike 12 of 97 %. Similarly, the winning probability of the strike -1 of 60% increases steadily to the strike -12 of 98%. We find that winning probability of selling option on WTI at strikes FOTM are reach 93 % and above. They have better probability than strikes at NTM. The loss probability of strike 1 of maximum 82% continues to decrease to strike 12 of 3 %. Similarly, the loss probability of the strike -1 of maximum 40% decreases steadily to the strike -12 of 2%. We find that loss probability of selling option on WTI at strikes at NTM are reach at maximum 80 % and below.

4.2 Winning data at FOTM strikes are not random and much better NTM

We analyzed the randomness of each data set using Minitab software. Our hypothesis was as followed.

H_0: The data is random.
H_1: The data is not random.

The results are presented in Table 2 below.

Table 2. Winning sample data at FOTM strikes are not random with K more than 90%

Strike	K (%)	Obs	Exp	P-Value	Description
12	97%	17	24.3	0	Significant, data is not random
11	96%	25	33.5	0	Significant, data is not random
10	95%	33	40.8	0	Significant, data is not random
9	93%	49	54.8	0.031	Significant, data is not random
8	90%	71	73	0.585	Not significant, data is random
7	87%	79	91.4	0	Significant, data is not random
6	83%	79	115.1	0	Significant, data is not random
5	77%	89	142.5	0	Significant, data is not random
4	67%	103	176.1	0	Significant, data is not random
3	59%	115	194.2	0	Significant, data is not random
2	43%	143	196.1	0	Significant, data is not random
1	18%	109	119	0.091	Not significant, data is random
-1	60%	194	192	0.831	Not significant, data is random
-2	75%	142	151.7	0.197	Not significant, data is random
-3	83%	98	113.8	0.005	Significant, data is not random
-4	87%	76	92.9	0	Significant, data is not random
-5	90%	61	74.6	0	Significant, data is not random
-6	91%	55	68.1	0	Significant, data is not random
-7	92%	43	58.2	0	Significant, data is not random
-8	93%	39	51.3	0	Significant, data is not random
-9	95%	29	40.8	0	Significant, data is not random
-10	96%	19	29.9	0	Significant, data is not random
-11	97%	13	20.5	0	Significant, data is not random
-12	98%	9	14.8	0	Significant, data is not random

Where, strike is price trading position, K is winning probability, Obs is observation, Exp is the expectation, P is P-value (≤ 0.05) and Description is hypothetical decision.

Table 2 explains that the K value more than 50% indicates that sample data number 1 (win) is more dominant. This shows that the winning probability of selling option on WTI is more dominant. The K value under 50% indicates that sample data number 0 is more dominant. This shows that the loss probability of selling option on WTI is more dominant. All K values at FOTM strikes are more than 90%. These show that the winning probability of selling option on WTI on at FOTM strikes are much better than NTM.

Strikes -2, -1, 1, and 8 have P-value above α (0.05) that is 0.19, 0.83, 0.09, and 0.58 respectively, accept H_0 (reject H_1). This indicates that the data on these strikes are random. This randomness data means that the data does not have a pattern that can be understood systemically. Strike 8 has a value of 90% K as random data means that winning probability of selling option on WTI is 90% but the data has no deterministic pattern.

4.3 Winning proportion at FOTM strikes are much higher than at NTM

We performed a parametric test to confirm the results of the previous test. We use one-sample proportion t-test. We analyzed the proportion of each data set using Minitab software. Our hypothesis is as follows.

H_0: Proportion = 0.50
H_1: Proportion > 0.50

The results are presented in Table 3 below.

Table 3. Winning proportion at FOTM strikes are much higher than at NTM

Strike	N	Mean	StDev	SE Mean	95% Lower Bound	T	P
12	397	97%	17%	0.9%	96%	54.75	0
11	397	96%	20%	1.0%	94%	45.06	0
10	397	95%	22%	1.1%	93%	39.86	0
9	397	93%	26%	1.3%	91%	32.74	0
8	397	90%	30%	1.5%	87%	26.47	0
7	397	87%	34%	1.7%	84%	21.84	0
6	397	83%	38%	1.9%	80%	17.19	0
5	397	77%	42%	2.1%	73%	12.71	0
4	397	67%	47%	2.4%	63%	7.37	0
3	397	59%	49%	2.5%	54%	3.46	0
2	397	43%	50%	2.5%	39%	-2.83	0.998
1	397	18%	39%	1.9%	15%	-16.52	1
-1	397	60%	49%	2.5%	56%	4.09	0
-2	397	75%	44%	2.2%	71%	11.27	0
-3	397	83%	38%	1.9%	80%	17.42	0
-4	397	87%	34%	1.7%	84%	21.51	0
-5	397	90%	30%	1.5%	87%	26.02	0
-6	397	91%	29%	1.5%	88%	27.93	0
-7	397	92%	27%	1.4%	90%	31.38	0
-8	397	93%	25%	1.3%	91%	34.24	0
-9	397	95%	22%	1.1%	93%	39.86	0
-10	397	96%	19%	1.0%	95%	48.37	0
-11	397	97%	16%	0.8%	96%	60.46	0
-12	397	98%	13%	0.7%	97%	73.12	0

Where strike is price trading position, Mean is the proportion value of the win (symbol number 1), StDev is standard deviation, SE Mean is standard error of mean value, 95% Lower Bound is lower bound of mean, T is t-value should be higher than t-table (1.96), P is p-value should be lower than α (0.05).

Table 3 explains that the t-values at strike -1 to -12 and strike 3 to 12 are higher than t-table (1.96) and p-values are lower than α (0.05). Those strikes are significant to reject H_0 (accept H_1). It means that the proportion of win is higher than 50%. The t-values at strike 1 and 2 are lower than t-table (1.96) and p-values are higher than α (0.05). Those strikes are not significant to accept H_0 (reject H_1). It means that the proportion of win sample is below 50%. These show that the win probabilities of selling option at NTM strikes are worse than FOTM.

Standard deviation at strike -1 by 49% then decreases to 13% at strike -12. Similarly, the standard deviation at strike 2 by 49% and then decreased to 17% at strike 12. Standard error of mean at strike -1 by 2,4% then decreases to 0,6% at strike -12. Similarly, the standard error of mean at strike 2 by 2,4% and then decreased to 0.8% at strike 12. This shows that the standard deviation at the FOTM strikes position is lower than at the NTM.

A 95% lower bound value indicates that the probability value above 90% is in the strike FOTM strike -9 to -12 and strike 9 to 12. This means that the winning probability of selling option on WTI at those strikes position are relatively secure to do.

5. Discussion

We have analyzed winning probability with descriptive, non-parametric and parametric statistical methods. All of these methods showed the same result. Selling call option in strike 1 positions had a winning probability of 18% and then the winning probability increased at further strike position up to 97% in strike 12. Similarly, selling put option in strike -1 positions had a winning probability of 60% and then the winning probability increased at further strike position up to 98% in strike -12. This shows that the three methods we applied were mutually support each other.

This winning probability results are supported by the standard deviation value obtained. Standard deviation at FOTM strikes were lower at NTM strikes. This indicates that the WTI price volatility at FOTM strikes is low relatively and more secure for trading. Standard error of mean at FOTM strikes are lower at NTM strikes. This suggests that FOTM strikes can be considered for open selling options on WTI.

The winning sample data at FOTM strikes were not random with K more than 90%. This shows that the existing sample data has a good deterministic pattern so that it is easy to predict. The mean value of the sample data on the FOTM strikes is also seen above 90%, so that it has a good probability for investment. Winning proportion at FOTM strikes are higher than at NTM strikes. This shows that the value of the winning proportion is more dominant than the sample loss in the FOTM strikes.

The results supported previous research. Berkovich and Shachmurove (2013) explained that the winning probability of the FOTM strike of selling put option on SPX was high. Long (1973) explained that selling options on WTI on the FOTM strike could provide a high winning probability. Li (2013) explained that the selling option on index on the FOTM strike had a higher probability of receiving a positive premium. Courdier and Gross (2009) explained that selling options on futures on the FOTM strike would have a much higher winning probability than the NTM strike, if it done in the right way. Wolfinger (2014) and Zerenner and Chupka (2008) explained that selling options conservatively had a higher probability of winning than buying options. Murray (2012) developed a profitable method on selling options at the FOTM strike. Asianto (2014) stated that the winning probability of selling options on WTI on the FOTM strike was much higher than that of the NTM strike, so that the selection of the FOTM strike was preferred over the NTM strike. Franke et al. (1998) explained that the conservative investors would choose selling options on the FOTM strike with a high probability of winning. Summa and Lubow (2002) explained that more than 80 percent of buying options on futures The S & P 500 expires worthless. The winning probability of buying options on futures was low, while the winning probability of selling options on futures was high. Asianto (2014) explained that WTI's selling option on FOTM strike period July 2013 to February 2014 had a win probability of 83.3 percent, so it was better than buying option.

This results also supported some previous research. Rettig and Zulauf (2015) explained that crude oil for the period of 2007-2012 in the 1 month expiration period had the highest nonlinear time decay velocity. This time decay was supported to selling option position. Thus selling option had the highest probability of winning. Mckeon (2017) found that the time decay option in the 30-60 day expiry period had a decay velocity higher than the longer period and resulting in the highest probability of winning. Jose and Kanchan (2017) explained that the time value decay speed was getting increase along with less expiration time. Opportunity win buyer option was getting decrease. The chance of winning seller option was getting increase. Siddiqi (2013) explained that the speed of time decay further supported the probability of winning selling option.

These results supported the views of Hull (2017), McKeon (2017), Asianto (2014), Wolfinger (2014), Mugwagwa et al. (2012), Jorion (2011), Augen (2010), Augen (2009), Cordier and Gross (2009), Garner and Brittain (2009), Meester (2008), McMillan (2004), Summa and Lubow (2002), Bhattacharya (1987), and Long (1973) which explained that an increase in the rate of decline in the value of option premiums in a nonlinear condition along with the reduced expiration of the option had an increase of the winning probability of selling options.

6. Conclusion

Empirical results indicate that during the study period, the winning probability of selling option on WTI at the FOTM strikes position is much higher than at the NTM strikes. The further the strike is from the at the money position, the higher the winning probability is. Selling options on WTI at FOTM strikes at a low volatility can be considered to be opened as an conservatif investment.

We can increase the probability by choosing the appropriate strikes according to market prediction. If we predict the market moves up, we can open sell put option on WTI at FOTM strike. Otherwise, If we predict the market goes down, we can open sell call option on WTI at FOTM strike. The probability of strike position opposite the market view is higher than the probability of strike position similar to the market view.

Abel et al. (2014:281) explain that the business cycle is persistent. Each economic downturn is followed by subsequent declines, each economic growth is followed by subsequent growth. This condition makes volatility increase drastically. Therefore, if we predict that the market will be in turbulence, we can not open selling option. But if we have already opened the trades and the volatility suddenly spikes up, we should close the trades to avoid a spike risk in investment.

These results have important implications for economics, trade policy makers and stakeholders that the FOTM strikes have a higher probability than the NTM in low to moderate volatility. Therefore, it is important to pay attention to the WTI price volatility changes. This study has limited data. Further research can be done with a wider range of data and in certain periods during a crisis.

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