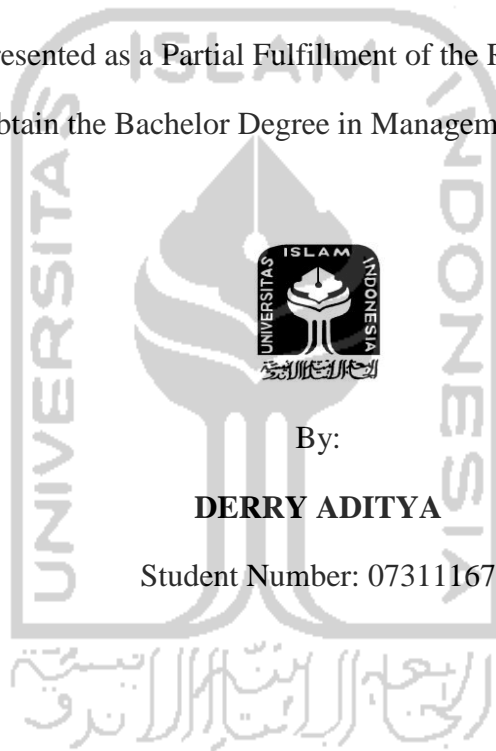# COMPARATIVE ANALYSIS OF CALL OPTION APPLICATIONS USING BUTTERFLY STRATEGY AND CONDOR STRATEGY TO RETURN ON INVESTMENT IN OPTION CONTRACT

(CASE OF LQ 45 INDEX ON INDONESIAN STOCK EXCHANGE PERIOD 2008 – 2010)

Presented as a Partial Fulfillment of the Requirements

to Obtain the Bachelor Degree in Management Department

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DEPARTMENT OF MANAGEMENT

INTERNATIONAL PROGRAM

FACULTY OF ECONOMICS

UNIVERSITAS ISLAM INDONESIA

YOGYAKARTA

2012

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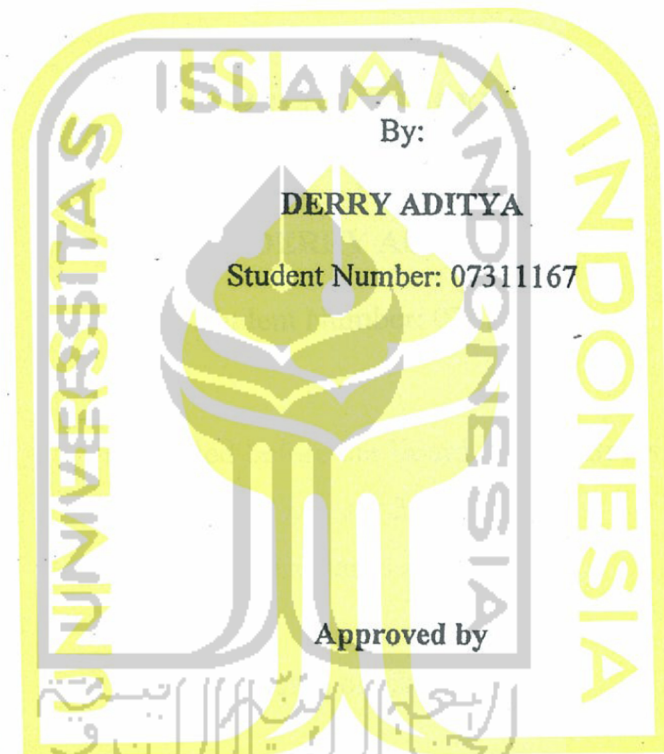
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COMPARATIVE ANALYSIS OF CALL OPTION APPLICATIONS USING BUTTERFLY STRATEGY AND CONDOR STRATEGY TO RETURN ON INVESTMENT IN OPTION CONTRACT

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Examiner I

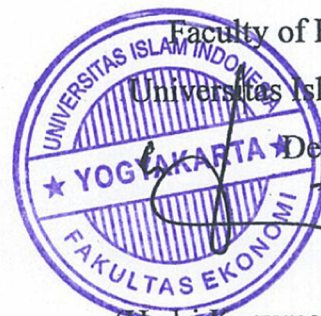Dwipraptono Agus Harjito Dr.,M.Si

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DECLARATION OF AUTHENTICITY

Herein I declare the originality of the thesis; I have not presented anyone else's work to obtain my university degree, nor have I presented anyone else's words, ideas or expression without acknowledgment. All quotations are cited and listed in the bibliography of the thesis.

If in the future this statement is proven to be false, I am willing to accept any sanction complying with the determined regulation or its consequence.

Yogyakarta, January 19th, 2012

Derry Aditya

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"In the name of My Lord the Most Gracious and the Most Merciful"

Finally, I could finish and present this thesis to obtain the Bachelor degree in the Faculty of Economics, Islamic University of Indonesia. This thesis was accomplished with tremendous supports and efforts from many parties, because I realize that no one can win alone. Thus, I would like to give my sincere gratitude and appreciation to those who have always been helping and supporting me:

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Abstract

Derry Aditya (2012). **"Comparative Analaysis of Call Option Applications Using Butterfly Strategy and Condor Strategy to Return on Invesment in Option Contract (Case of LQ45 Index on the Indonesian Stock Exchange Period of 2008 – 2010)."**

Invesment is the instrument which made by the purpose to obtain money. In detail the investor done the investment by investing certain amount of capital in financial assets or tangible assets. In the application, investment needs a function of hedging that help the investor to avoid big number of loss. The instrument that provides function of hedging in invesment is option, with *Butterfly Spread Strategy* and *Condor Spread Strategy* the investor will get a function of hedging on option.

For that Reason, this reasearch is conducted to know the best strategy between *Butterfly Spread Strategy* and *Condor Spread Strategy* in obtain good return on invesment in option contract of LQ45 index within period of 1 month, 2 months, and 3 months contract in period of 2008 – 2010.

Black Scholes Option Pricing Model is used to estimate call option price and followed by calculating the return on invesment of both strategies from chosen period.

Overall, the results of this research show that *Buterfly Spread Strategy* is good option strategy in terms of return on invesment within period of 1 month, 2 months, and 3 months contract in period of 2008 – 2010.

Keywords : Financial Management, Investment, Derivatives, Option, Buttefly Strategy, Condor Strategy

Abstrak

Derry Aditya (2012). **"Comparative Analaysis of Call Option Applications Using Butterfly Strategy and Condor Strategy to Return on Invesment in Option Contract (Case of LQ45 Index on the Indonesian Stock Exchange Period of 2008 – 2010)."**

Investasi adalah sebuah intrumen yang dilakukan dengan tujuan memperoleh keuntungan. Lebih jelasnya seorang investor melakukan investasi dengan menanamkan sejumlah modal di sektor-sektor keuangan atau sektro riil. Dalam prakteknya, investasi memerlukan fungsi lindung nilai yang membantu investor dalam menghindari kerugian yang besar. Instrumen yang menggunakan nilai lindung adalah opsi, dengan *Butterfly Spread Strategy* dan *Condor Spread Strategy* investor memperoleh fungsi lindung nilai di dalam opsi.

Oleh karena itu, penelitian ini dilakukan untuk mengetahui strategi yang baik antara *Butterfly Spread Strategy* dan *Condor Spread Strategy* dalam mendapatkan return investasi pada kontrak opsi shama indeks LQ45 dengan jangka waktu kontrak 1 bulan, 2 bulan, dan 3 bulan pada tahun 2008 – 2010.

Black Scholes Option Pricing Model digunakan untuk mengetahui nilai premi kontrak opsi yang akan di ikuti dengan perhitungan return investasi dari periode yang telah ditentukan.

Dari hasil penelitian menunjukan bahwa *Butterfly Spread Strategy* merupakan strategi yang baik dalam hal mendapatkan return investasi dengan jangka waktu kontrak 1 bulan, 2 bulan, dan 3 bulan pada tahun 2008 - 2010

Kata Kunci : Manajemen Keuangan, Investasi, Derivatif, Opsi, Strategi Buttefly, Strategi Condor

CHAPTER I

INTRODUCTION

1.1 Background of Study

Every country wants its economy keeps growing and growing. Economic developments are encouraged by various factors, including increased export performance, expansion of job opportunities, and increased investment. In terms of economic development there is a connection with the management theory, especially financial management. Possessing the knowledge of financial management, the individual may recognize and understand the tools or the financial instruments and manage it according to its financial functions.

Furthermore on financial management, there is a theory that we recognized as *Investment. Investment* is putting money into something with the expectation of return for the purpose gaining profit. Basically, the investment is to buy an asset that is expected in the future can be resold at a higher value. In detail, the investment is made to obtain money (return results) by investing in financial sectors such as bonds, foreign exchange, and stock investments, but it also can be done in sectors such as property or manufacturing industry.

Real Asset Investment is investing certain amount of capital in assets outside the financial assets or commonly called as tangible assets, like land, gold, and building. Meanwhile *Financial Assets Investment* or generally called portfolio investment is investing a certain amount of funds in financial assets in the form of securities, such as deposits, bonds and stocks. One of the attractive investment

instruments other than the instruments that have been mentioned above is a derivative.

Derivatives can be defined as financial instruments whose value depends on the values of other basic variables (underlying variables/underlying asset). Usually the variable underlying the value of a derivative is a traded asset prices. In capital markets, there are several types of derivative instruments used either by individual or by organizations to invest, including futures/forward contracts, swap contracts, and one of them is an option contract

Option is an official contract which gives the holder the rights to buy/sell an asset or to exchange in the future at a certain date for a certain price. Moreover, assets on options have a certain prices such as the basic price or spot price and also exercise price/strike price. Maturity of an option contract also determines that option is worth it or not, if the option contract is not executed at the time of the maturity then the option is no longer valued. Option has been known in the scope of capital market since 1975, but in Indonesia only a few companies that have used the option contract. There are 4 companies that used the option contract which are PT. Telkom, Bank BCA, PT. Astra, and PT. Indofood.

In its development options contracts have many options strategies that can be used by investors, including bull strategy, bear strategy, strangle strategy, straddle strategy, condor strategy, butterfly strategy, box strategy, and calendars strategy. In this research, the researcher will compare the use of the butterfly spread strategy with calls to the condor spread strategy with calls.

In 2008, index price decrease due to the global crisis that hit. The previous study that examined the options contracts on the LQ-45 index in 2008 with a *butterfly* strategy explained that by investing using a butterfly strategy then the investor will get a function of hedging. And the function is to minimize the possible risks that will be received by investors when the index price decreases as in 2008. So it can be said that the possibility of large losses that will be borne by the investor can be minimized by the system of the hedge.

When the index price decreased in 2008 as it has been mentioned above, of course it would threaten investors suffered from losses. Then by the earlier reasearch has proved that return on investment earned by investors when investors use *butterfly* in option contract in 2008 remained on a positive rates or beneficial. It certainly shows the hedge characteristic that own by *butterfly* strategy proved to protect investors from losses or a larger risk when the index price decreased.

In this study, the researcher has known that the *butterfly* strategy is an option strategy that can provide a hedge function to the investors, and had proven to protect the investor's losses when the index price decreased. Then researcher learned based on theory that there are other strategies that have similar characteristic of hedge in *butterfly* strategy, the strategy is *condor* strategy. With a background of phenomena or event that has been described, the researcher would like to compare between the uses of both strategies, which one can produce better return on invesment. The result of this research is expected to be used as an input for investors in performing option contract.

If we see in previous study, although there has been no research on the use of condor strategy, the results of research with using *butterfly* strategy proved more profitable than using *condor* strategy on option contract. But if we view from the characteristic of the advantages owned by *condor* strategy, investor will get a greater profit. It becomes the reason to see how the comparison of return on investment from both strategies.

Some references mentioned both strategies which are almost the same, whether in terms of making a purchase and selling contract to make investments and in terms of the risk responsibility. It also mentioned that the condor strategy is a variation of the butterfly strategy. Both strategies have a low risk, but also low benefit.

The same advantages of both strategies, for example are having low risk in investing and providing hedging to investors, while the disadvantage for investor is that they have not that big payoff. Because of those several similarities the researcher finds them attractive reason to do research to compare both strategies in an *option contract*.

Moreover these two strategies use a contract on long positions and short calls at the same time where both contracts are very contradictory, it is also considered to be interesting to do research because the strategies are quite extreme strategy (a strategy that is more complicated than other strategies to apply), so the researcher thinks there are more challenges in the preparation of his research.

Butterfly spread with calls strategy actually is executed using four *calls*, with the same period and also the same stock, but it looks like executing three

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calls because the execution done by purchasing one *call* with low *exercise price*, purchasing one *call* with high *exercise price*, and selling two *calls* with mid *exercise price*.

While *condor spread with calls strategy* is executed with the same concept using four *calls*, there are differences with *butterfly spread with calls. Condor's* execution is done by purchasing one *call* with low exercise price, selling one *call* with high exercise price, and purchasing one *call* with the most high exercise price. In term of selling both *calls* there are some differences.

In calculation of the option *butterfly* and *condor* strategy that must use the underlying assets and the same time period, it needs to use the "LQ45" index as underlying assets which is researched and with the same period of option contract for one month, two months, and three months during the period 2008 – 2010

So by comparing the use of the butterfly spread strategy with condor spread strategy, researchers can find out which strategy is better in terms of achieving returns that will be used as an alternative for investors to invest in options contracts on the Index LQ 45. Thus this study takes the title:

"Comparative Analysis of Call Option Applications Using Butterfly Strategy and Condor Strategy to Return on Invesment in Option Contract of LQ 45 Period 2008 – 2010"

1.2 Problem Identification

Based on the background that is already stated and on the research tittle, the point of this research is to compare the strategy in option especially *butterfly spread with calls strategy* and *condor spread with calls strategy* in LQ 45 index to determine which one is the best on period 2008 - 2010

1.3 Problem Formulation

Errors in decision making on invesment strategy when investor makes an investment contract becomes one of problems that caused investors suffered loss. Based on the background research that has been described previously and according to research titles, the problems can be formulated, such as:

1. How is the application of call option in LQ 45 Index with a period of 1 month, 2 months and 3 months by using *butterfly spread with calls strategy* in the year 2008-2010 to the return on investment?

2. How is the application of call option in LQ 45 Index with a period of 1 month, 2 months and 3 months by using *condor spread with calls strategy* in the year 2008-2010 to the return investment?

3. Which is better strategy to use *butterfly* or *condor* strategy for the return on investment at LQ 45 index?

1.4   Problem Limitation

Several limitations should be acknowledged to maintain the focus of this research. The research will only compare about *Butterfly spread with call strategy* and *Condor spread with call strategy* in LQ 45. And the data also limited in order to focus on the research.

1. Stock Price of LQ 45 issued during the year 2008 to 2010

2. Volatility of LQ 45 during the year 2008 to 2010

3. Data SBI issued during the year 2008 to 2010

1.5   Research Objectives

The objectives of this research based on the problem that have been formulated above are:

1. To define the result of return on investment in LQ 45 index with period of 1 month, 2 months, and 3 months by using *butterfly spread with call strategy* in year 2008 – 2010

2. To define the result of return on investment in LQ 45 index with period of 1 month, 2 months, and 3 months by using *condor spread with call strategy* in year 2008 – 2010

3. To know which one is better strategy in terms to find the return on investment in LQ 45 within period 2008 - 2010

1.6   Research Cobtribution

1.   For academicians

Hopefully, this research is expected to be useful in field of financial management, espescially in the field of derivatives market, the type of instruments, strategis and implementation of techniques in real terms. Beside of that, this research is also expected to be reference for the next research.

2.   For investors

The result of this study can be an input to investors, so the investor could step forward in making the decision on option contract with selecting which one is the best to avoid the risk in term of loss (mistake in invesment decision making).
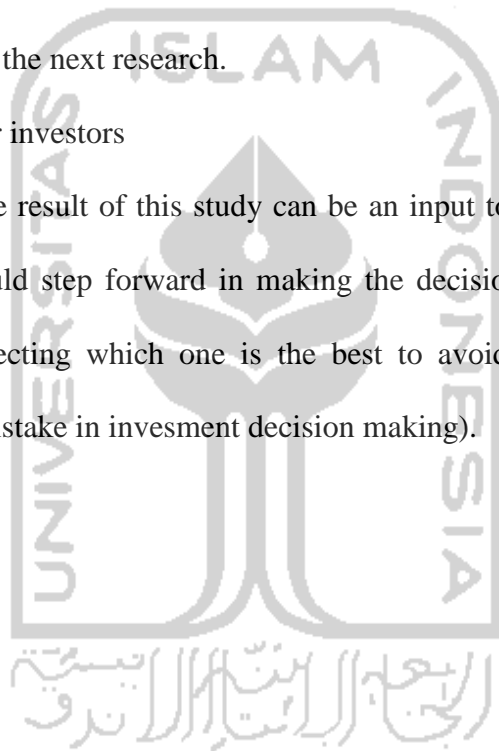
CHAPTER II

REVIEW OF RELATED LITERATURE

2.1   Theoretical Review

2.1.1   Financial Management

Financial management is a system that describes how individuals or organizations evaluate management for investment and also to increase the capital in funding process. Financial management happens in the scope of the financial markets.

Titman, Keown & Martin (2011, p.20) stated that financial market is any place where money and credit exchanged. When someone takes out a car loan from a bank, He/she participate in the financial markets.

Basically, financial markets have three parties involved in. which are :

1. Borrowers

    Borrowers are those who need money to finance the needs they have, for example, the needs of funds for investment costs or the cost of doing business expansion.

2. Investors

    Savers (investors) are those who have money to invest. The investment that is made by them is for a reason to collect money by investing their capital.

3. Financial Institutions

Financial institution is an institution that helps borrowers and savers to trade in financial markets. It can be said the financial institution is an organization of both parties in performing financial transactions.

2.1.2 Investment

In finance, investment is putting money into something with the expectation of return. By putting money the investors will gain the return in the future. Bodie, Kane, and Marcus (2009) stated that invesment is the current commitment of money or other resources in the expectation of reaping future benefit.

In terms of investment, there are two forms of investment that can be entered by investors. Both forms of investment are:

1. Real Assets Investment

Real Assets Investment is doing investment in certain amount of capital in assets excluding financial assets or commonly called as tangible assets, such as land, gold, and building. Some examples of investing in the real sector are buying land for reselling when price of land is high, buying the store to be rented as a place of trade in textiles or other goods, building factories, buying and selling gold and many other investments.

2. Financial Investments

Financial Investments or often called as Portfolio Investment is doing investment on certain amount of funds in the form of securities, such as deposits, bonds and stock. For example investment in financial sector are saving money in the bank, buying stock, bonds, mutual funds (reksadana), or others securities.

The characteristic of investment in financial sector which distinguish it from real sector is the needs of intermediary. Another characteristic of financial assets investment is the information that can be obtained from the prospectus, annual reports and proposal.

2.1.3 Derivative

Derivative is a financial instrument whose the value of transaction comes from the derivative assets that is more basic or commonly called as underlying assets. Hull (2009) stated that derivative can be defined as a financial instrument whose value depends on (or derives from) the values of other, more basic underlying variables.

Assets which underlying the value of derivative may came from various sources, such as stocks, market index, interest rates and so on. Derivatives itself has several instruments that are traded, in example *forward & future contract, swaps,* and the one of them is *option (option contract).*

2.1.4 Option

Option is a derivative instrument which has different criteria than the other derivative instruments, the option gives the right (but not the obligation) to swap assets or to sell or buy an underlying asset at a price and time that has been determined, Reilly and Brown (2009) stated that an option contract gives its holder the right but not obligation to conduct a transaction involving an underlying security or commodity at predetermined future date and at a predetermined price.

There are two types of option in this instrument which are *call option* is the right to buy and *put option* is the right to sell. *Call option* is the right that is given to the owner of a contract to buy the assets in the future with a certain price and time that has been agreed. While the *put option* gives the right to the owner of the contract to sell the assets in the future with price level and time that has been agreed.

In every *option* transactions there are two parties which involved and it called as buyer and seller. The buyers of option pay a certain amount to the *option* seller; it is called as option price (premium). Option seller receives cash upfront, but has potential of debt for in the future. The advantages and disadvantages of the option seller are inversely to the advantages and disadvantages owned by the option buyer.

So the option contract containing several terminologies that must be understood which are:

1. *Strike Price / exercise price of call option*

    A set price when the contract is executed in the present time that has to be paid by the buyer of the contract when the contract expired.

2. *Exercise of call option*

    An execution by paying *strike price* in order to obtain asset.

3. *Expiration date*

    A maturity time where an option contract must be executed or otherwise it becomes useless.

4. *Exercise style*

    There are two systems in option contract that is called as The *American* option and The *European* option. The differences between those options contract are The *American* option could execute the option contract before it ended or in certain time. Meanwhile, the execution of *European* contract can be done when the contract ends or in maturity time.

2.1.5 Option with calls

The use of call option can be described on the illustration in index. Let's assume the investor buy *European call options* with *strike price* $90 for buying 100 shares of LQ 45 index. Suppose the current price of index is $70, the expiration date of the options is 6 month, and the price of option is $6. Because the option is European, the investor can exercise only on the expiration date. If the stock price on this date is less than $90, the investor will clearly choose not to exercise. Because it definetely will make the investor suffered losses from the payment of the option price for $600 (came from $6/share x 100 shares).

And if the current price in maturity time is more than $90, the investors will use their right to buy the option. Suppose the current price in maturity time is $97. By using their right, investors can buy 100 share of LQ 45 index for $90 / share. So that the profit that gained from investor and directly sell LQ 45 index in market price is about $7 / share exclude the transaction costs. If the investor put the option price it will became $100 (came from [$97 - $90 - $6] x 100 shares)

By seeing the explanation above, it can be defined that the investors who owned the call option has the rights to choose the best way to deal with the option contract. And surely the contract owner will not use their rights if the maturity of stock price is lower than the strike price /exercise price. In this situation commonly called as *out the money* position. Meanwhile, the owner of the contract will use their rights to

execute the option contract if the maturity of stock price is bigger than the exercise price. This situation commonly called as *in the money* position. If the maturity of stock price is same as the exercise price, then it can be called that the option contract is on *at the money* position.

The other important thing that must be considered is when using the rights of an option contract towards its option price. Example, when the maturity of LQ45 index price is $95. If investor using their right, they will suffer $100 loss (from [$95 - $90 - $6] x 100 shares). That will be better than if the investor not using their right when they will $600 loss (from $6 x 100 shares).

Figure 2.1 shows how potentially the investor's net profit or loss in certain of LQ 45 index price on call option at maturity time.

Strike Price = $90
Option Price = $6
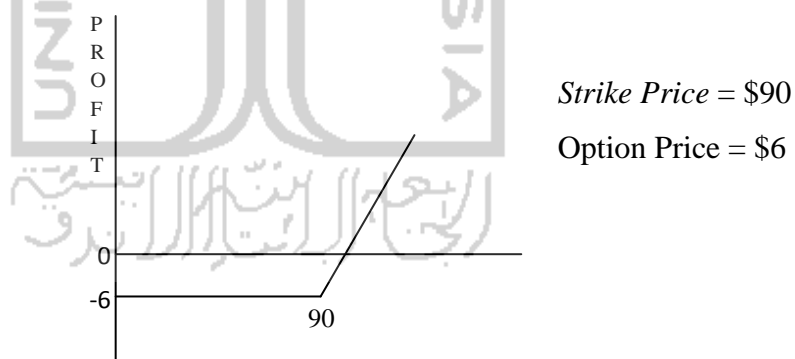
Figure 2.1 Profit from buying European call option on LQ 45 index
Source: (Hull, John C., 2009:180)

Figure 2.1 explained about the position where the first time the investor suffered losses because of paying for the option price. But in the future the profit gained from this position is infinite (unlimited). The BEP

situation happened when price is in $90, and the profit gained will be increase and increase if the stock price in the future is above $90.

And then figure 2.2 will shows how potential the variation of profit or loss that investor will be suffered in certain of LQ 45 index price on call option at maturity date for option's writer.
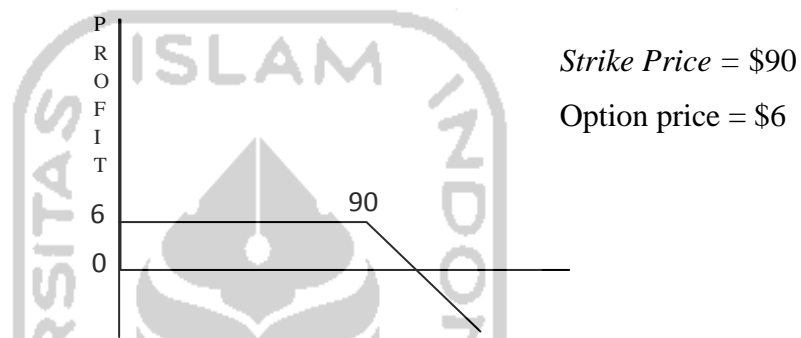
Figure 2.2 proft from selling European call option on LQ 45 index
Source: (Hull, John C., 2009:182)

Figure 2.2 explained about the position where the investors gained profit for the option price only by the option's writer (short call option). But in the future the loss that will be suffered by investor is unfinite (unlimited).

Thus by explanation from the illustrations above, can be assumed if the X is strike price and S_T is final price at maturity, so the payoff for *European option* is :

1. Max $(S_T − X, 0)$ applied to long position in *European call option* and it reflects that the call option will be exercised if $S_T > X$ (*in the money* position) and will not be exercised if $S_T < X$ (*out of money* position).

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2. Min (X - S_T, 0) or – max (S_T – X, 0) applicable to short position in *European call option*.

2.1.6 The Butterfly Spread with Calls

Kolb (2000) and Hull (2009) mentioned some strategies that can be used in implementing or combining a policy of the option contract. Each strategy has its own characteristic on risk and also the income. Severeal strategies include:

1. *Bear and bull strategy*

2. *The box spread strategy*

3. *Butterfly spread strategy*

4. *The condor spread strategy*

5. *The straddle strategy*

6. *The strangle strategy*

According to the description of the limitation problems that has been described previously, this research will use the application of *butterfly spread with calls* strategy and will be compare it with the *condor spread with calls* strategy.

Kolb (2000) stated that butterfly spread strategy is a strategy that used three calls with the same period and also same stock. This strategy is performed by buying one calls with low exercise price, buy one calls with a high excercise price, and selling two calls with a medium excercise price.

Butterfly strategy on option contract usually used in situations after the index price moves volatile (moves significantly). After the volatile move of index price usually price will move in sideways position (the movement of stocks not fluctuate). In unfluctuactive price movements, the *Butterfly strategy* can be used because it will gain profit.

In using this strategy, the contract holders will get something called as hedging, where when the long call is purchased suffered loss, the short call sold will bring profit, vice-versa. But the profit gained by contract holder will not be great.

By the characteristic of this strategy that has been described above, *Butterfly spread with calls* strategy will involve the contract to use three calls with different strike price. And it will be described further through an illustration on application of *Butterfly spread with calls* strategy.

Table 2.1 Butterfly Spread with Calls

Strike price ($)	Call price($)
55	10
60	7
65	5

Source: *Hull, John C., (2009:226)*

An investor will make an option contract by using *butterfly spread with* calls strategy for a period 6 months, then/so he will buy one call with strike price $ 55 and option price $ 10, buy one call with strike price $ 65 and option price $ 5, and selling two calls with strike price $ 60 and option

price $ 7. So the cost that will be spend to make the strategy is $ 10 + $ 5 – (2 x $ 7) = $ 1

The first assumption, if the stock price is at $ 55 on the expiration time, then the position of long call with strike price $ 55 gives a loss of $ 10 (from option price), and the position of long call with strike price $ 65 can not be executed because the stock price is lower than strike price that will give a loss of $ 5. Meanwhile short call position will provide a profit of 2 x $ 7 = $ 14. So if the position of stock price is at $ 55, investors still suffered a loss of $ 1 (came from $ 14 – [$ 10 + $ 5]).

The second assumption, if stock price is at $ 60, then the position of long call with strike price $ 55 still suffered a loss of $ 5 as result of option price payments (profit $ 5 – option price $ 10). And the long call with strike price $ 65 is not executed and clearly suffered a loss of $ 5. Meanwhile the short call with strike price $ 60 will provide a profit of 2 x $ 7 = $ 14. So if the position of stock price is at $ 60, investors will gain a maximum profit of $ 4 (came from profit $ 14 - $ 10 of option price).

The third assumption, if stock price is at $ 65, then the position of long with strike price $ 55 will be at BEP position because the profit of $ 10 will covered the option price of $ 10. And the long call with strike price $ 65 is suffered a loss of $ 5. While on the short call with strike price $60 will generate profit of $ 4 (came from profit $ 14 - $ 10 of execution losses). So if the the position of stock price is $ 65, it will bring the

investors suffered a loss of $ 1 (came from profit $ 4 - $ 5 of option price

losses).
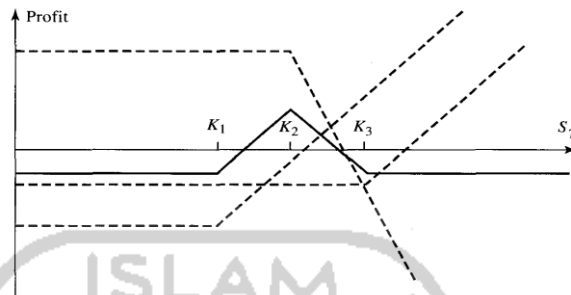
Figure 2.3 Profit from call option using Butterfly strategy

Source: *Hull, John C (2009, p.227)*

Description:

K_1: $ 55 (exercise long call)

K_2: $ 60 (exercise short call)

K_3: $ 65 (exercise long call)

From the figure 2.3 above it can be concluded that the profit area is

only around the point of K_2, which is when the stock price on the position

between K_1 + option price ($ 56) and K_3 – option price ($ 64). While the

maximum profit will be gain when the stock price is at K_2.

2.1.7 The Condor Srpead with Calls

Condor spread with calls strategy is an option strategy that

involves four calls from the same underlying asset and also same

expiration time. The execution of this strategy is done by buying one call

with low exercise price, sell one call with slightly high exercise price, sell

one call with quite high exercise price, and buying one call with the most high of exercise price.

The use of *Condor strategy* is almost the same as *Butterfly strategy*, which is used in a situation after the index price moves volatile (moves significantly). After the volatile moves of index usually will move in sideways position (the movements of stocks do fluctuate). So in the use of *Condor strategy* investors will expect the move of price is less volatile (unfluctuative). So at that position, when the price falls or rises, investors will continue to have profit as long as the index value will remain on the profit area, or even suffered some loss when the price goes down those losses would not be too great / large.
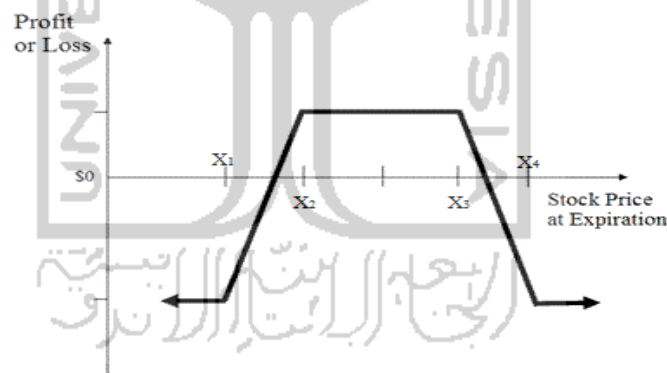
Figure 2.4 Profit from call option using Condor strategy

Source: *Kolb, Robert W (2000, p.331)*

From the characteristic of strategy that has been explained, *Condor spread with calls* strategy involve the contract to use four different calls with different strike price. And it will be describe further through an illustration on application of *Condor spread with call* strategy.

Table 2.2 Condor spread with calls

Strike price ($)	Call price($)
Long 1 call 90	10
Short 1 call 95	7
Short 1 call 100	4
Long 1 call 105	2

Source: *Kolb, Robert W (2000, p.330)*

Assuming that an investor will make an option contract by using *Condor spread with call* strategy, so he will buy one call with strike price $ 90 and option price $ 10, sell one call with strike price $ 95 and option price $ 7. And also sell one call with strike price $100 and option price $ 4, and buy one call with strike price $ 105 and option price $ 2. Then the cost that will be spend and also becomes maximum loss is $ 1 (came from ($ 7 + $ 4 – [$ 10 + $ 2]).

The first assumption, when stock price is $ 90 on expiration date, then the position of long call with strike price $ 90 will give a loss of $ 10 (option price). And the position of long call with strike price $ 105 will not be executed and give a loss of $ 2. Meanwhile the position of short call with strike price $ 95 will provide a profit of $ 7, and the position of short call with strike price $ 100 will provide a profit of $ 4. So if the position of stock price is at $ 90, the investor will suffered maximum loss of $ 1 came from (profit $ 7 + $ 4) – (loss $ 10 + $ 2).

The second assumption, when stock price is $ 95 on expiration date, then the position of long call with strike price $ 90 will gives a loss of $ 5 due to option price $ 10 ($ 5 - $ 10). And the position of long call

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with strike price $ 105 will surely give a loss of $ 2. Meanwhile on the position of short call with strike price $ 95 will provide a profit of $ 7, and also the position of short call with strike price $ 100 will provide a profit of $ 4. So if the position of stock price is at $ 95, the investor will gain profit of $ 4 (came from profit [$ 7 + $ 4] – loss [$ 5 + $ 2]).

Next assumption, when the position of stock price on expiration date is $ 100, then the position of long call with strike price $ 90 will reach BEP position, where the profit covered the option price. And the position of long call with strike price $ 105 will give a loss of $ 2. Meanwhile in the position of short call with strike price $ 95 will provide a profit of $ 2 (profit $ 7 – loss from execution $ 5), and the position of short call with strike price $ 100 will provide a profit of $ 4. So if the position of stock price is at $ 100 the investor will gain a profit of $ 4 (came from [profit $ 4 + $ 2] – [loss $ 2]).

Last assumption, if the position of stock price when expiration date is $ 105, then the position of long call with strike price $ 90 will provide a profit of $ 5. And the position of long call with strike price $ 105 still suffered a loss of $ 2 due to the payment of option contract. Meanwhile the position of short call with strike price $ 95 will be executed and will suffered a loss of $ 3. And the execetution of short call position with strike price $ 100 will also provide a loss of $ 1. So if the position of stock price is at $ 105 the investor will suffered a loss of $ 1 (profit $ 5 – [loss $ 2 + $ 3 + $ 1]).

From the explanation of assumptions above, it can be defined that the profit will occurre when the stock price is at the position between $ 91 to $ 104, and the maximum profit that may be obtained by the investor when the stock price position is at $ 95 and $ 100 or the position when those two short call are performed.

2.1.8 Factors that affect the price of options

Kolb & Overdahl (2003) stated that there are several factors will affect option price. The factors are:

1. Stock price (current price)

Payoff from call option can be defined as a difference between the stock price on expiration date and strike price (exercsice price). So the value of call option will be more valueable with the increase of stock price (current price) otherwise the value of call option becomes less valueable when the stock price is falling.

2. Expiration time / expiration date

An addition to the value of call option will not be always equal to the addition or the increasing in the period of maturity time. It happens because during any period the holder of *European call option contract* will be only executed the option at maturity time.

3. Risk-Free Interest Rate

The risk-free interest rate affects the price of an option. The risk-free interest rate usually obtained from the value of SBI (Sertifikat Bank Indonesia). By the increasing of interest rate in economy growth, the expected growth of the stock price tends to increase. Meanwhile the present value of any future cahs flows that received by the option holders will decrease. For the *call options* holders, the increasing of stock price will increase the value of *call option*, while the decreasing of present value of any future value cash flows will decrease the value of *call option*. However, the first effect dominates the second effect, thus increasing the risk-free interest rate will increase the value of call option.

It should be emphasized that the statement above is based on the assumption that the others factors did not change. Because in practice, sometimes when the risk-free interest rate increases, then the stock price will tend to decline/decrease.

4. Volatility of the Stock Price.

Volatility of index price is a size of how uncertainties about the movement of index price in future. Volatility can also be interpreted as the standard deviation of the return value of the stock for a year that has been through the process of continuous compounding. With increasing of volatility, the possibility of index price will rise or fall will increase.

So the *call option* price will tends to increase as well as the increase of volatility.

2.1.9 Black-Scholes Option Pricing Model

In early 1970's Fischer Black and Myron Scholes found a formula to calculate the value of stock options, the model or formula is called as *Black-Scholes option pricing model.*

The model of this formula was found through a process of mathematics reduction which is very complex with the underlying assumption which is will be described below, Hull (2009, p.286-287):

1. Behavior of stock price follows a lognormal distribution μ and σ constant.

2. No tax expense and transaction costs.

3. During the age of option, the index does not distribute dividens.

4. There is no chance to do arbitrage free-risk.

5. The activity of buying and selling of shares takes place continuously.

6. The investor can lend or borrow money at the same risk-free interest rate.

7. Constant risk-free interest rate (r).

Black-Scholes Model produces a formula to evaluate a call option as below, Hull (2009, p.291):

$$c = S_0 N(d_1) - Xe^{-rT} N(d_2)$$

$$d_1 = \frac{\ln (S_0 / X) + (r + \sigma^2 / 2)T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln (S_0 / X) + (r - \sigma^2 / 2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

Where:

S_0 = Stock price / current price

X = Strike price / exercise price

T = Maturity time

r = Risk-free interest rate

σ = Volatility of stock price

c = Value of European call option

$N(x)$ = Cumulative probability distribution to a variable which normally disributed with standard deviation = 1

It should be understood that r is the nominal of interest rate; the value of r must be greater than zero (r > 0).

2.1.10 Volatility Estimation (Standard Deviation)

Volatility estimation performed to determine the spread of value or the uncertainty of price on stock or index. There are two approaches to estimate the volatility which are *Historical volatility* and *estimated volatility*. *Historical* volatility is obtained from purely historical data,

while the *estimated* volatility is obtained by simple linear regression model, so can obtain more accurate value of volatility.

In this research the estimation that will be used is using the *historical* estimates of volatility, based on the assumptions that the volatility which occurred in the past will continue to apply in the future. So in performing historical volatility required a sample of the index price movements at a certain period. Then the calculation is by calculating the rate of return from index which will be seen its movement, and then from the return value of the index is performed the conversion process become *continuously compounded*, after that the result of the conversions will be calculate the value of standard deviation.

The rate of return on the index data can be daily, weekly, monthly or a certain time desired. For a daily rate of return, then what will be obtained is daily standard deviation. While the calculation of *Black-Scholes model* takes the annual standard deviation, from the daily standard deviation that has been obtained we performed the calculation process by doing multiplication of variance index with the number of day on index trading in a year, the number of day on Index trading in a year is approximately 252 days.

Another way to obtain the annual standard deviation from the daily standard deviation is by doing multiplication index standard deviation with $\sqrt{252}$. While in monthly rate of return, to obtain the required annual standard deviation in the *Black-Scholes model,* it is necessary to multiply

variance of the index with number of trading months in a year, which is 12 months.

2.1.11 Previous Study

Jimmy Okta Didoris (2010) make a research about the application of call option using *Butterfly* strategy at PT. Telekomunikasi Indonesia Tbk index on Indonesia stock exchange in period of 2007 – 2009. The research used descriptive method by describing *butterfly spread with calls* strategy. This strategy is a concept that related with *European call option*, the purpose of this research is to measure the return on invesment of option contract at PT. Telkom index by using *butterfly spread with call* strategy.

The variables from this research are *underlying asset* (PT. Telekomunikasi Indonesia Tbk), *call option price* (premium), *exercise price, free-risk interest rate,* and *expiration date.* And the result from this research is return on investment of call option contract by using *butterfly* with period 1 month, 2 months, 3 months on year 2007 – 2009 are giving the investors loss and profit. Rp523.0459/share of profit gained for 1 month contract, Rp443.6558/share of profit gained for 2 months contract, and Rp15.6008/share of suffered loss for 3 months contract.

The differences with the previous research are located on strategy, object and period of research. To define the return on investment Jimmy Okto uses *Butterfly* strategy meanwhile the researcher choose two

strategies which are *Butterfly* and *Condor* strategy. The object from earlier

research is PT Telekomunikasi Indonesia Tbk index, while the researcher

takes LQ 45 index as the object. Also period of time, Jimmy Okto make a

research with period 2007 – 2009 which different with the period from

researcher 2008 – 2010.

2.2   Theoretical Framework

Today the investment increasingly widespread has been done by the

individual and corporate, investment could be done in two sectors, which are *Real*

Asset and *Financial Assets*. On investments in the financial sector (*Financial*

Asset Investment) which is performed in the Indonesian Stock Exchange, the

investors do investment business. They buy an assets or shares from the company

that issued stocks with variance of stocks instrument.

The instrument in its development is more attractive to be an instrument to

do investing; one of the instruments is derivative which is an instrument by

referring to the value of an underlying asset. The types of derivatives according to

Grinblatt & Titman, (2002, p.216) include:

a. *Forwards Contracts*

b. *Futures Contracts*

c. *Swaps Contracts*

d. *Options Contracts*

In this reasearch the derivative instruments that will be used is an *option*

contract. By performing *option contract*, an investor will earn the rights (not

obligation) to buy or to sell stock/shares at a certain price and maturity. *"Option give their buyers the right, but not the obligation, to buy (call option) or sell (put option) an underlying security at a prespecified price, known as the strike price."* (Grinblatt & Titman, 2002, p.223)

By purchasing the option contracts in investing, the investors are expected to obtain their rights according to the condition of stock price at maturity time. So to make a profit or a return of investment from option contract, investors can perform variety of methods or option contract investment strategy. From many option contract strategies that can be used, there are two strategies that are interesting in which both of them have the characteristic in terms of hedging on the profit and the risk that borne by investors.

This research will compare the use of both strategies which are *Butterfly* and *Condor* strategy in generating the return of investment on an index. By using the criteria of stock price which is equivalent for both strategies; it would be known the strategy that can provide better *return* of investment for investors will be discovered.

From those few descriptions that have been outlined, the outline framework of research will be illustrated in figure 2.5 below.
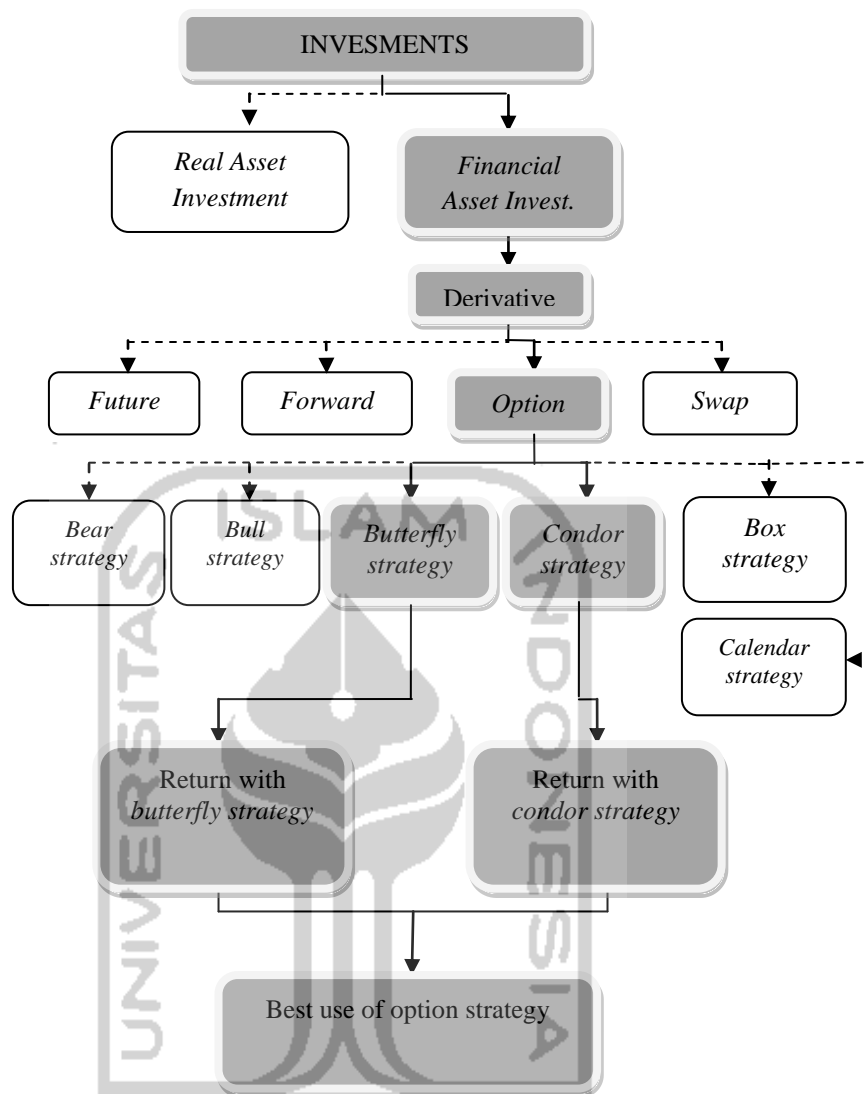
Figure 2.5 Framework

Description: ——— Factors that will be examined

‐ ‐ ‐ Factor that will not examined

Based on the figure 2.5, it can be look that the researcher wants to compare both strategies which are *Butterfly* and *Condor* strategy to the return of an invesment in the stock option contract.

2.3   Hypothesis Formulation

H1:   There is a difference between performance of call option application from butterfly and condor strategy to return on invesment in option contract.

CHAPTER III

RESEARCH METHOD

3.1   Research Method

Data can be classified into two types: qualitative and quantitative. This research will use quantitative data, which can be discrete or continuous. Discrete variable can be assumed only as a certain value and usually there is gap between. Meanwhile continuous variable can be assumed to be in form of any values in any specific range. By using this data then the researcher will analyze the use of both strategies. Then the data will be processed to result in the conclusion about the best strategy towards LQ 45 index in period 2008 – 2010.

This research includes the comparative test because it examines the comparison between *Butterfly spread with calls* and *Condor spread with calls* towards the stock price of LQ 45 index that listed in IDX.

3.2   Research Subject

The samples being investigated in this research are LQ 45 index during period of 2008 – 2010.

3.2.1   Research Sample

In this research, the data population is secondary data. The required data depends on the object and on the identification problem that has been explained previously. Then, several samples

are found from several sources based on the following several criteria:

1. Stock Price of LQ 45 issued between the year 2008 to 2010
2. Volatility of LQ 45 between the year 2007 to 209
3. Data SBI issued between the year 2008 to 2010

3.3 Research Setting

The researcher will use Indonesian Stock Exchange (IDX) listed on internet because of the easier downloading.

3.4 Research Variables

Based on the tittle of the research, **"Comparative Analysis of Call Option Applications Using Butterfly Strategy and Condor Strategy to Return on Invesment in Option Contract of LQ 45 Period 2008 – 2010"**, the operational variable and the measurement will be described below on table 3.1

Table 3.1

Operational Variable and Measurements Scale

Variable	Definition of Variable	Indicators	Measurements	Scale
Call option price	The option price (premium) to obtain the right of an option	Option price (call premium)	Rupiah	Ratio
Current price	Index price of LQ 45 when when a contract was made	Index price when make a contract	Rupiah	Ratio
Strike price	Index price of LQ 45 when maturity time	Index price of maturity time	Rupiah	Ratio
Index volatility	Measurement of uncertainty index price movements in future	Standard deviation based on historical data or the level of index volatility	Percentage	Ratio
Period of the option	The maturity time that has been agreed when make a contract	1, 2, and 3 months	Time limit	Ratio
Free risk interest rate	The level of interest measured by using SBI	Sertifikat Bank Indonesia (SBI)	Percentage	Ratio

3.5   Technique of Data Analysis

The data that used to be analized in this research is quantitative data with processing by calculation aprroach model, formula and appropriate mathematical function.

3.5.1 *Black-Scholes Option Pricing Model*

Black-Scholes Model produces a formula to evaluate a *call option* as below *(Hull, 2009:291)*:

$$c = S_0 N(d_1) - Xe^{-rT} N(d_2)$$

$$d_1 = \frac{\ln\left(S_0 / X\right) + \left(r + \sigma^2 / 2\right)T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln\left(S_0 / X\right) + \left(r - \sigma^2 / 2\right)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

Where:

S_0	=	Stock price / current price
X	=	Strike price / exercise price
T	=	Maturity time
r	=	Risk-free interest rate
σ	=	*Volatility* of stock price
c	=	Value of *European call option*
N(x)	=	Cumulative probability distribution to a variable which normally disributed with standard deviation = 1

It should be understood that r is the nominal of interest rate; the value of r must be greater than zero (r > 0).

3.5.2 *Call Option*

The calculation of call option is to find the value of profit or loss which will be obtained from a *call contract*. In *Long call*, a contract maker pays an *option price* (premium) for buying the right of *option* in the future.

Profit or loss obtained from the calculation of price in maturity minus with price that we agreed when make contract, and the minus the option price (premium).the profit gained will goes unfinite, while the maximum loss suffered only of option price (premium).

$$\Pi = Sr - (X + c)$$

Description

Π = Profit or Loss

Sr = Price of maturity time

X = Price agreed

C = Option price (call premium)

Meanwhile on *Short call*, there is an obligation to sell *option* in future. Profit or loss came from option price (premium) plus the result of price in maturity minus price agreed on contract. In the position as the seller will produce maximum profit just of option price (premium), while the loss suffered will be on unfinite number.

$$\Pi = c + (X - Sr)$$

Description

Π = Profit or Loss

Sr = Price of maturity time

X = Price agreed

C = Option price (call premium)

3.6 Research Procedures

The figure below will explain about the the step to analyzing the data using both strategies.

Figure 3.1

Research Process

Source: Febriawan, TB. Dicky (2010)
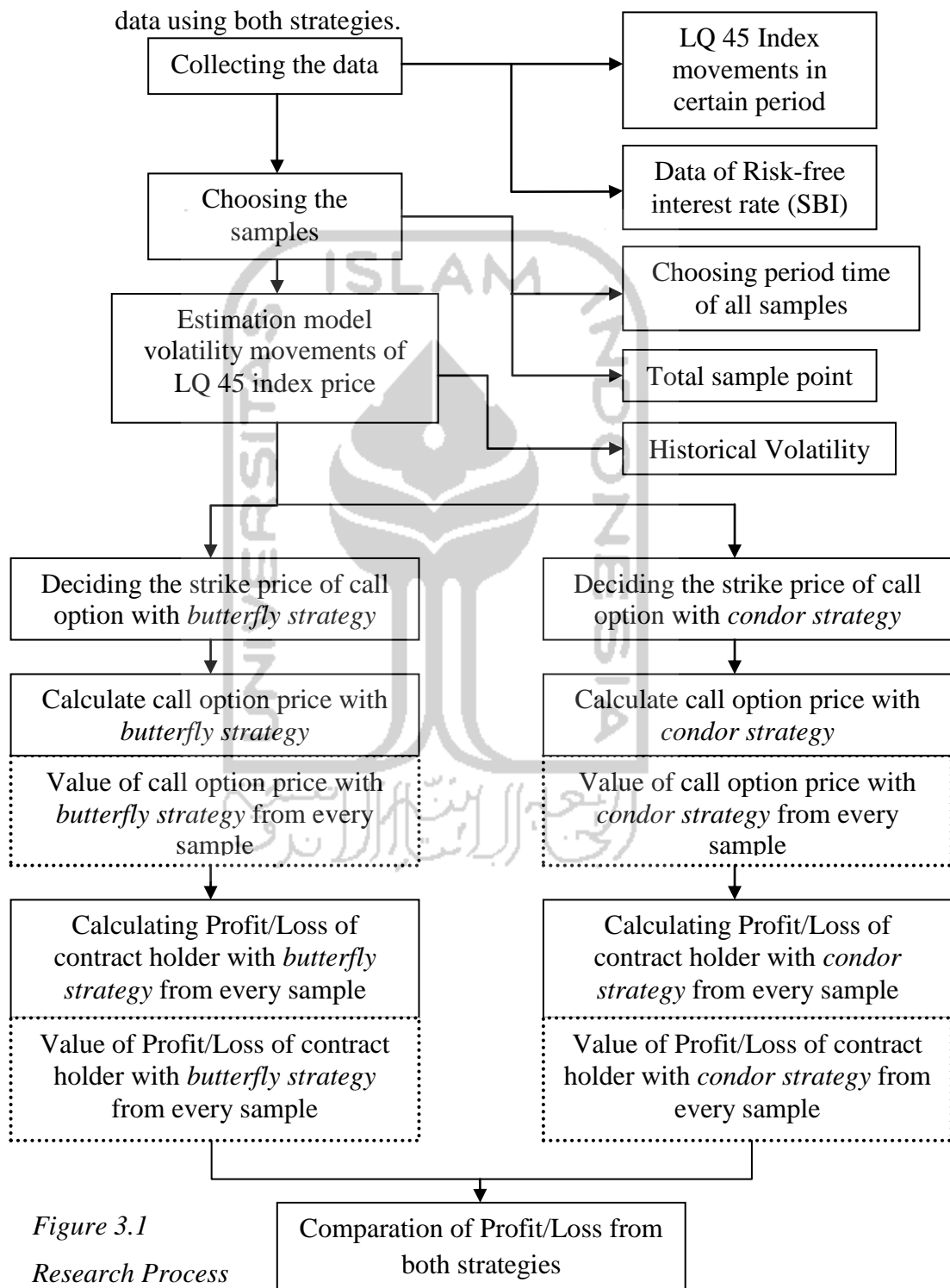
The figure 3.1 shows the step of this research as follows:

1. Collecting the data choosen as the sample to calculate the call option.

2. Estimating the volatility index movements and calculate from every sample taken. This calculation uses historical data in every day on every year to estimate the volatility.

3. Deciding the strike price of call option from both strategies.

4. Calculating of call option price in every sample by using *Black Scholes Option Pricing Model* for both strategies.

5. Calculating of profit/loss from call option in every sample on the maturity time.

6. Calculating overall profit/loss within contract 1,2, and 3 months
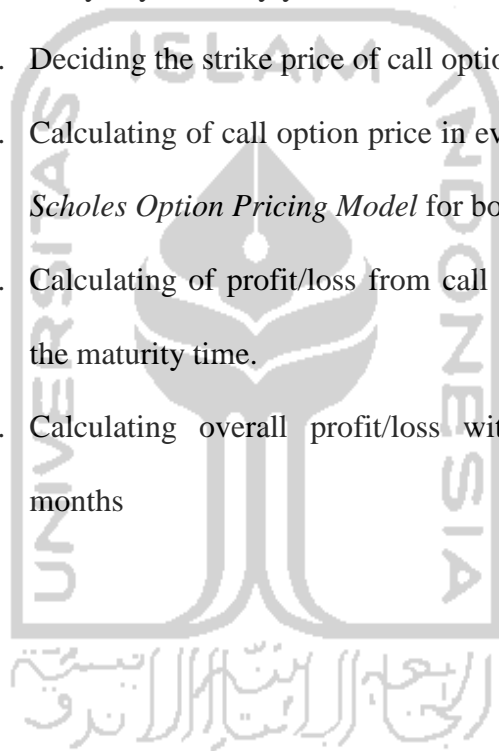
CHAPTER IV

RESEARCH FINDINGS, DISCUSSION, AND IMPLICATIONS

4.1   Description of Research Variable

4.1.1   Movements of LQ45 Index

This research used 31 (thirty one) samples that consist of value movements from LQ45 index for 31 months strating from January 2008 until July 2010. The value used as the data of index price is the closing price of stock in the end of month. Meanwhile the sample points are determined from index value in first date of monthly index transactions in every month. Table 4.1 will shows data movements of LQ45 index in 3 years.

Table 4.1

LQ45 Current Index Movements 2008 - 2010

No.	Date	Current index	No.	Date	Current index
1	02/01/2008	596.554	17	01/05/2009	342.783
2	01/02/2008	570.511	18	01/06/2009	391.064
3	03/03/2008	573.347	19	01/07/2009	400.125
4	01/04/2008	511.987	20	03/08/2009	458.634
5	02/05/2008	503.807	21	01/09/2009	452.726
6	01/07/2008	513.062	22	01/10/2009	486.452
7	01/08/2008	503.936	23	02/11/2009	465.719
8	01/09/2008	467.831	24	01/12/2009	484.828
9	01/09/2008	449.362	25	04/01/2010	507.914
10	06/10/2008	326.970	26	01/02/2010	504.938
11	03/11/2008	262.084	27	01/03/2010	497.195
12	01/12/2008	237.031	28	01/04/2010	550.38
13	05/01/2009	290.869	29	03/05/2010	572.532
14	02/02/2009	256.935	30	01/06/2010	527.276
15	02/03/2009	242.475	31	01/07/2010	558.358
16	01/04/2009	289.417			

Source: www.duniainvestasi.com

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4.1.2 Level of Risk-Free Interest Rate

The risk-free interest rate includes in *Black-Scholes Model* formula to calculate the value of *Call Option*. The level of risk free rate that will be use is *"Sertifikat Bank Indonesia"* (SBI) for period of 1, 2 and 3 months in year 2008 – 2010. The risk-free interest rate affects the price of an option, where increase of risk-free rate usually makes *call option* value increased.

4.1.3 Historical Volatility

Historical volatility is the history of probability movements of index in previous year on the current year of research. The value of *historical volatility* is standard deviation of LQ45's value. Table 4.2 below will show the value of *historical volatility* from LQ45 index in 2007 - 2009.

Table 4.2

Historical volatility of LQ45 index in 2007 -2009

Year	Standard deviation	Volatility
2007	0.0169	26.774%
2008	0.0296	47.048%
2009	0.0171	27.094%

4.2   Research Findings

4.2.1   Call Option in LQ45 Index with Butterfly Strategy

Calculating *call option* using *butterfly strategy* needs three values of exercise price and three different value of *call option price (premi)*. Those three call option price come from three different, with assumption that investor expects maximum 5% increase from the index price agreed, those three different assumptions are:

a. Lowest Exercise Price (X_1)

The lowest exercise price was applied with assumption that future index price will be same with the current index price (So = X). The application of this assumption can be found from the example of index price in January 2008, where the index price of LQ45 in January was 596.554. So the value of the lowest exercise price (X_1) will be equal with current index price (So) which was 596.554. That value will be used as the exercise price to make *long call* contract.

b. Highest Exercise Price (X_3)

The highest exercise price was applied with assumption that future index price will increase up to 5% from the current index price. For the example the index price of LQ45 in January 2008 was 596.554. So the highest exercise price (X_3) was 596.554 x [1 + 5%] = 626.382. That value will be use as the exercise price to make *long call* contract.

c. Middle Exercise Price (X_2)

Middle exercise price (X_2) was applied with the assumption that future index price will placed between the higest and the lowest exercise price. The application of this assumption can be found from the example of LQ45 index price in January (596.554). The lowest exercise price(X_1) was 596.554 and the highest (X_3) was 626.382, so middle exercise price (X_2) was (596.554 + 626.382) x 0,5 = 611.468. That value will be use as the exercise price to make *short call* contract.

The value of those exercise prices will define the call option price which has to be paid by the investors. *Exercise price* and *call option* have negative relationship where increase of exercise price will decrease the call option price and vice versa. But in condition that other variables are constant.

After defining the strike price the researcher continues to calculate the call option price using *Black Scholes Option Price Model*, and the pay off calculation of long/short call (see appendix). From the pay off the investor will decide wheter execute the contract or not. There are several conditions from investor that decide to execute the contract, which are:

1. For long call positions :
   a) The investor will *execute* the contract if the number of pay off is greater than the call option price.

b) The investor will *not execute* if the number of pay off is lower than the call option price.

2. For short call positions :

a) The investor will *execute* the contract if the number of pay off is lower than the call option price.

b) The investor will *not execute* if the number of pay off is greater than the call option price.

4.2.2   ROI of LQ45 Index Using Butterfly Strategy

Figure 3.1 described the steps to analyze the data of return on investment after defining the *call option price*. Then, the figure also shows the calculation of return on investment. Having the value of return on investment as written furthermore as ROI, the investor has the right to decide whether the option contract will be executed or not in maturity of the option contract itself.

4.2.2.1 ROI of LQ45 Index Using Butterfly Strategy in 2008 (1, 2 and 3 months)

a)   ROI in one month contract

Table 4.3 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within one month period in 2008 by considering current index price and call option price.

Table 4.3

ROI Using Butterfly Strategy with One Month Contract on LQ45 Index in

2008

Month	Index Price at Maturity Time	Contract Execution	Profit/Loss			Total
			HI LONG CALL	*MID SHORT CALL*	*LOW LONG CALL*	
Jan	570.511	No	-20.379	26.078	-8.295	-2.597
Feb	573.347	1) Hi Long Call	-16.654	26.181	-8.327	1.201
Mar	511.987	No	-19.569	23.389	-7.439	-3.619
Apr	503.807	No	-17.482	23.026	-7.324	-1.780
May	513.062	1) Hi Long Call	-7.954	23.558	-7.499	8.106
Jun	503.936	No	-17.596	23.281	-7.417	-1.732
Jul	467.831	No	-17.374	21.771	-6.943	-2.547
Aug	449.362	No	-16.230	20.926	-6.675	-1.979
Sept	326.970	No	-15.599	15.322	-4.892	-5.169
Oct	262.084	No	-11.412	12.508	-4.004	-2.908
Nov	237.031	No	-9.293	11.355	-3.637	-1.575
Dec	290.869	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	45.407	-84.470	38.350	-0.713
TOTAL			-124.135	142.926	-34.103	-15.311
			-15.311 (**LOSS**)			

Table 4.3 consists of 12 samples started from January till December within one month period of contract. The result from all those samples indicates the loss of 15.311 index point to the investor.

The loss experienced by the investor in one month contract is caused from the decrease of current index price which automatically followed by the position of *long call* and make the investor did not execute the contract. Meanwhile in *short call*, because of the decrease of current index price which make the investor did not execute the contract, it gives profits caused from payment of call option price. But in the final result, the loss from *long call* experienced by the investor is greater than the profit from *short call*.

b)   *ROI in two months contract*

Table 4.4 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within two months period in 2008 by considering current index price and call option price.

Table 4.4 consists of 12 samples started from January till December within two months period of contract. The result from all those samples indicated the loss of 10.719 index points to the investor. Loss experienced by the investor is because the decrease of current index price. Although the number of loss is decreased in *long call*, but the profit gained from selling (*short call*) was unable to cover the loss experienced from buying (*long call*).

Table 4.4

ROI Using Butterfly Strategy with Two Months Contract on LQ45 Index in

2008

Month	Index Price at Maturity Time	Contract Execution	Profit/Loss			Total
			HI LONG CALL	MID SHORT CALL	LOW LONG CALL	
Jan	573.347	No	-29.928	45.693	-17.053	-1.289
Feb	511.987	No	-28.622	43.698	-16.309	-1.233
Mar	503.807	No	-28.789	43.957	-16.407	-1.239
Apr	513.062	1) Hi Long Call	-24.648	39.279	-14.662	-0.031
May	503.936	1) Hi Long Call	-25.190	38.663	-14.433	-0.959
Jun	467.831	No	-25.944	39.646	-14.811	-1.109
Jul	449.362	No	-25.742	39.383	-14.730	-1.089
Aug	326.970	No	-24.111	36.925	-13.825	-1.012
Sept	262.084	No	-23.169	35.484	-13.286	-0.972
Oct	237.031	No	-16.944	25.964	-9.728	-0.707
Nov	290.869	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	14.910	-23.151	7.675	-0.567
Dec	256.935	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	7.291	-8.570	0.766	-0.513
TOTAL			-230.887	356.971	-136.803	-10.719
			-10.719 (**LOSS**)			

c)   *ROI in three months contract*

Table 4.5 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within three months period in 2008 by considering current index price and call option price.

Table 4.5

ROI Using Butterfly Strategy with Three Months Contract on LQ45 Index in 2008

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss			Total
			HI LONG CALL	*MID SHORT CALL*	*LOW LONG CALL*	
Jan	511.987	No	-37.647	60.825	-24.232	-1.054
Feb	503.807	No	-36.004	58.170	-23.174	-1.008
Mar	513.062	No	-36.310	58.684	-23.387	-1.013
Apr	503.936	No	-32.451	52.450	-20.904	-0.905
May	467.831	No	-31.932	51.612	-20.570	-0.890
Jun	449.362	No	-32.788	53.036	-21.155	-0.907
Jul	326.970	No	-32.710	52.986	-21.167	-0.890
Aug	262.084	No	-30.702	49.785	-19.909	-0.826
Sept	237.031	No	-29.489	47.820	-19.123	-0.793
Oct	290.869	No	-21.527	34.919	-13.968	-0.577
Nov	256.935	No	-17.699	28.778	-11.540	-0.461
Dec	242.475	1) Hi Long Call	-10.672	26.221	-10.522	5.027
TOTAL			-349.932	575.286	-229.652	-4.298
			-4.298 (**LOSS**)			

Table 4.5 consists of 12 samples started from January till December within three months period of contract. The result from all those samples indicated the loss of 4.298 index points to the investor. The loss experienced by the investors in option contract within three months period is caused by the high number of call option price. Different with one/two option contract, more time needed in make option contract means more money spent to make an option contract.

The profit gained from short call position could not cover the loss experienced from long call position. Every month, the investor experienced a loss from the total short and long call position. Only in December the investor gains a profit.

From the table above the investor only made one type of execution; they only execute *long call* in December. It is better to execute than to pay call option price; which was caused by the high number of call option price when making option contract within three months period.

4.2.2.2 ROI of LQ45 Index Using Butterfly Strategy in 2009 (1, 2 and 3 months)

a) *ROI in one month contract*

Table 4.6 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within one month period in 2009 by considering current index price and call option price.

Table 4.6

ROI Using Butterfly Strategy with One Month Contract on LQ45 Index in

2009

Month	Index Price at Maturity Time	Contract Execution	Profit/Loss			Total
			HI LONG CALL	MID SHORT CALL	LOW LONG CALL	
Jan	256.935	No	-17.019	27.363	-10.851	-0.507
Feb	242.475	No	-14.893	23.924	-9.479	-0.447
Mar	289.417	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	32.963	-59.315	25.930	-0.422
Apr	342.783	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	36.755	-65.601	28.342	-0.504
May	391.064	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	28.680	-47.974	18.698	-0.596
Jun	400.125	1) Hi Long Call	-13.247	35.784	-14.156	8.381
Jul	458.634	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	35.744	-60.504	24.064	-0.696
Aug	452.726	No	-26.062	41.791	-16.527	-0.798
Sept	486.452	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	8.024	-3.605	-5.206	-0.787
Oct	465.719	No	-27.597	44.246	-17.495	-0.846
Nov	484.828	1) Hi Long Call 2) Mid Short Call	-7.314	27.432	-16.751	3.367
Dec	507.914	1) Hi Long Call 2) Mid Short Call	-4.415	22.161	-17.434	0.312
TOTAL			31.621	-14.297	-10.865	6.459
			6.549 (**Profit**)			

Table 4.6 consists of 12 samples started from January till December 2009 within one month period of contract. By the execution decision done by the investor, all of those samples gave profit of 6.549 index points. In the calculation of each month, it shows that only 3 months gave the investor profits, which are in June, November and December. In another 9 months, the investors experienced a loss. However, the profit gained in 3 months was greater than the loss experienced in 9 months.

In option contract within one month period of contract, most of the profits come from *long call* position. The profit of *long call* position was caused by the increasing of current index price in 2009, although in March, September and November 2009 the call option price decreased, it did not influence the increase of current index price in 2009.

Different from *short call* position, the increasing current index prices gives loss and decreases the profits gained from *long call* position. However, in the end, the number of profits gained by executing *long call* is still greater than the loss experienced by investing in *short call*, so the profits still gained by the investor.

b)   *ROI in two months contract*

Table 4.7 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within two months period in 2009 by considering current index price and call option price.

Table 4.7

ROI Using Butterfly Strategy with Two Months Contract on LQ45 Index in

2009

Month	Index Price at Maturity Time	Contract Execution	Profit/Loss			Total
			HI LONG CALL	MID SHORT CALL	LOW LONG CALL	
Jan	242.475	No	-24.785	42.802	-18.376	-0.358
Feb	289.417	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	10.848	-14.786	3.621	-0.317
Mar	342.783	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	80.033	-153.522	73.190	-0.299
Apr	391.064	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	77.602	-147.367	69.408	-0.357
May	400.125	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	29.020	-48.733	19.290	-0.423
Jun	458.634	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	35.444	-60.240	24.313	-0.482
Jul	452.726	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	19.805	-28.702	8.404	-0.494
Aug	486.452	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	-9.701	31.916	-22.781	-0.566
Sept	465.719	1) Hi Long Call 2) Mid Short Call	-23.992	60.345	-27.269	9.085
Oct	484.828	No	-39.705	68.376	-29.271	-0.600
Nov	507.914	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	4.171	4.378	-9.124	-0.575
Dec	504.938	1) Hi Long Call 2) Mid Short Call	-19.466	52.176	-29.176	3.533
TOTAL			139.275	-193.358	62.230	8.147
			8.147 (**Profit**)			

Table 4.7 consists of 12 samples strarted from January till December 2009 within two months period of contract. By the execution decision done by the investor, all of those samples gave profit of 8.147 of index points. In calculation of each month, only two months investor gained profits; in September and December 2009. Meanwhile another 10 months investors experienced losses, but the profits gained are greater than the loss experienced.

The profit gained in two months contract in 2009 resulted from investing in *long call. Long call* position giving profit was caused by the increasing of current index price in 2009. Although in September and November 2009 the call option price decreased, but it did not influence the increase of current index price in 2009. The loss experienced in two months contract was greater if compared with one month contract, it was caused by the longer time in making contract will be followed by the higher price to make the contract. Because of that when investor experienced a loss in *short call*, the profit gained from *long call* was able to cover the number of loss experienced.

c)   *ROI in three months contract*

Table 4.8 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within three months period in 2009 by considering current index price and call option price.

Table 4.8

ROI Using Butterfly Strategy with Three Months Contract on LQ45 Index in

2009

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss			Total
			HI LONG CALL	*MID SHORT CALL*	*LOW LONG CALL*	
Jan	289.417	No	-31.022	55.267	-24.536	-0.291
Feb	342.783	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	58.803	-110.703	51.642	-0.257
Mar	391.064	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	123.265	-239.990	116.482	-0.243
Apr	400.125	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	80.721	-153.607	72.595	-0.290
May	458.634	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	80.585	-151.858	70.929	-0.344
Jun	452.726	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	21.820	-32.966	10.754	-0.393
Jul	486.452	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	45.609	-80.292	34.281	-0.402
Aug	465.719	1) Hi Long Call	-39.467	82.712	-36.621	6.624
Sept	484.828	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	-13.765	39.918	-26.609	-0.455
Oct	507.914	1) Hi Long Call 2) Mid Short Call	-27.775	68.869	-38.722	2.372
Nov	504.938	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	-7.947	28.642	-21.162	-0.468
Dec	497.195	1) Hi Long Call 2) Mid Short Call	-36.729	86.729	-38.612	11.387
TOTAL			254.099	-407.279	170.421	17.241
			17.241 **(Profit)**			

Table 4.8 consists of 12 samples started from January till December 2009 within three months period of contract. By the execution decision done by the investor, all of those samples gave profit of 17.241 index points. In monthly calculation, only three months investor gained profits; in August, October and December 2009. Meanwhile the other 9 months investors experienced losses, but profits gained were greater than the loss suffered.

The loss experienced by investor in three months option contract is higher because of the payment of call option price to obtain the right of option contract. However, the increase of call option price in three months contract is very high, and when in some month the call option price decreased, it did not affect the profit gained which was came from both of *long call* position. So in the end the investors gained more profits in three months contract rather than in one/two month contract because the loss experienced by investors in *short call* can be covered by profit gained when executing *long call* position.

4.2.3.3 ROI of LQ45 Index Using Butterfly Strategy in 2010 (1, 2 and 3 months)

a) ROI in one month contract

Table 4.9 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within one month period in 2010 by considering current index price and call option price.

Table 4.9

ROI Using Butterfly Strategy with One Month Contract on LQ45 Index in

2010

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss			Total
			HI LONG CALL	*MID SHORT CALL*	*LOW LONG CALL*	
Jan	504.938	No	-17.203	23.065	-7.360	-1.498
Feb	497.195	No	-17.100	22.926	-7.316	-1.489
Mar	550.380	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	36.356	-58.948	21.127	-1.466
Apr	572.532	1) Hi Long Call 2) Mid Short Call	3.555	8.140	-7.950	3.744
May	527.276	No	-19.328	25.901	-8.261	-1.688
Jun	558.358	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	13.259	-11.912	-2.902	-1.555
Jul	586.268	1) Hi Long Call 2) Mid Short Call	9.046	-2.620	-8.064	-1.638
TOTAL			8.584	6.552	-20.726	-5.590
			-5.590 (**Loss**)			

Table 4.9 consists of 7 samples started from January till July 2010 within

one month period of contract. By the execution decision done by the investor, all

of those samples indicated the loss of 5.590 index points. In calculation of each

month, almost in every month the investor experienced a loss. However, only in

April 2010 the investor gained profit, and the profit was unable to cover the losses

that happened in the other months.

The loss experienced by investor in one month contract was caused by the

long call position which always experienced a big loss. It happened because of the

fluctuactive condition of current index price, resulting the *long call* position oftenly not executed by the investor. Even though they execute the *long call*, the purpose was still to cover the big payment of call option price. So the loss is caused by the big number of payment from call option price.

However profit is able to be gain through investing in short calls, but investor rarely executed it because the fluactuactive condition in current index price on 2010. Even though gaining profit, the loss gained from paying call option price in *long call* is greater than the profit gained by payment of call option price in *short call*. So, that condition still makes the investor experienced losses.

b)   *ROI in two months contract*

Table 4.10 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within two months period in 2010 by considering current index price and call option price.

Table 4.10 consists of 7 samples started from January till July 2010 within two months period of contract. By the execution decision done by the investor, all of those samples indicated the loss of 7.931 index points. Overall, every month the investor experienced a big loss. The loss was caused by investing in *short call* which is often executed and resulted big losses. Meanwhile in other position, investing in *long call* made the investor gain profits regarding by the right to execute when the call option price increased, but profit gained by investing in *long call* was unable to cover the loss experienced by investing in *short call*. So

the investor in option contract within two months period in 2010 still suffered loss.

Table 4.10

ROI Using Butterfly Strategy with Two Months Contract on LQ45 Index in

2010

Month	*Index Price at Maturity Time*	Contract Execution	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*	Total
			Profit/Loss			
Jan	497.195	No	-25.138	38.404	-14.350	-1.083
Feb	550.380	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	20.452	-27.458	5.930	-1.077
Mar	572.532	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	50.743	-88.242	36.439	-1.060
Apr	527.276	No	-27.253	41.639	-15.559	-1.174
May	558.358	No	-28.321	43.265	-16.165	-1.221
Jun	586.268	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	32.874	-51.714	17.716	-1.125
Jul	593.383	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	7.439	0.005	-8.634	-1.191
TOTAL			30.795	-44.102	5.377	-7.931
			-7.931 (**Loss**)			

c) *ROI in three months contract*

Table 4.11 will describe the return on investment in call option contract using *butterfly strategy* on LQ45 index within three months period in 2010 by considering current index price and call option price.

Table 4.11

ROI Using Butterfly Strategy with Three Months Contract on LQ45 Index in 2010

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss			Total
			HI LONG CALL	*MID SHORT CALL*	*LOW LONG CALL*	
Jan	550.380	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	10.910	-8.540	-3.258	-0.888
Feb	572.532	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	36.216	-59.232	22.133	-0.882
Mar	527.276	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	-0.809	14.618	-14.678	-0.869
Apr	558.358	1) Hi Long Call	-26.401	55.585	-22.168	7.016
May	586.268	1) Hi Long Call	-21.990	57.757	-23.032	12.735
Jun	593.383	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	33.165	-52.587	18.501	-0.921
Jul	661.646	1) Hi Long Call 2) Mid Short Call 3) Low Long Call	68.590	-122.584	53.018	-0.976
TOTAL			99.681	-114.982	30.517	15.216
			15.216 (**Profit**)			

Table 4.11 consists of 7 samples started from January till July 2010 within three months period of contract. By the execution decision done by the investor, all of those samples gave profit of 15.216 index points. In calculation of each month, only 2 month from 7 month investor gain profits which; are in April and

May 2010. Meanwhile the other 5 months, the investor experienced losses. However, the profit gained in two months is greater than total loss experienced in 5 months.

The loss experienced by investor in three months contract was caused by the increase of call option price. So investing in *short call* will experience losses. Meanwhile, the profit gained by doing option contract within three months period in 2010 was done through invesment in *long call*. *Long call* position gains profit because of the increase call option price in 2010. Even though in June 2010 call option price decreased, it did not affect the increase of call option price in the other 7 months on 2010. So the loss experienced from investing in *short call* could be covered by the profit gained from investing in *long call*, and made the investor gain profit in option contract within three months period on 2010.

4.2.3   Call Option in LQ45 Index with Condor Strategy

Calculating *call option* using *condor strategy* needs four values of exercise price and four different value of *call option price (premi)*. Those four call option price come from four exercises price which are different from the assumption that investor expects the increasing of index price is 5% from the index price agreed, those four different assumptions are:

a. Lowest Exercise Price (X_1)

The lowest exercise price was applied with assumption that in future the index price will be same with the current index price (So = X). The application of this assumption can be found from the example of index price in January 2008, where the index price of LQ45 in January was 596.554. So the value of lowest exercise price (X_1) will be equal with current index price (So) which is 596.554. That value will be used as the exercise price to make *long call* contract.

b. Slightly High Exercise Price (X_2)

The slightly high exercise price was applied with assumption that in future the index price will increase up to 1,25% from the current index price. For the example the index price of LQ45 in January 2008 was 596.554. So the slightly high exercise price (X_2) is 596.554 x [1 + 1,25%] = 604.011. That value will be used as the exercise price to make *short call* contract.

c. Quite High Exercise Price (X_3)

The quite high exercise price was applied with assumption that in future the index price will increase up to 3,75% from the current index price. For the example the index price of LQ45 in January 2008 was 596.554. So the slightly high exercise price (X_3) is 596.554 x [1 + 3,75%] = 618.925. That value will be used as the exercise price to make *short call* contract.

d. Highest Exercise Price (X₄)

   The highest exercise price was applied with assumption that in
future the index price will increase up to 5% from the current index
price. For the example the index price of LQ45 in January 2008 was
596.554. So the highest exercise price (X_3) is 596.554 x [1 + 5%] =
626.382. That value will be used as the exercise price to make *long
call* contract.

The value of those exercise prices will define the call option price has to
be paid by the investors. Different with *Butterfly, Condor Strategy* is an option
strategy that used four call option contracts. The steps are same and already
explained in *butterfly strategy*, next table will show the profit/loss gained from the
investor by executing the contract or not. In appendix show the call option price
and the pay off that influence the investor make the execution or not.

4.2.4   ROI in LQ45 Index Using Condor Strategy

   This is the result from the return on invesment (ROI) by using *condor
startegy* which leads the investor to make the execution or not. The pay off (see
appendix) will influence the investor to execute the contract or not. The following
is the explanation from each year within period of 1 month, 2 months, and 3
months.

4.2.4.1 ROI of LQ45 Index Using Condor Strategy in 2008 (1, 2 and 3 months)

a) *ROI in one month contract*

Table 4.12 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within one month period in 2008 by considering current index price and call option price.

Table 4.12

ROI Using Condor Strategy with One Month Contract on LQ45 Index in

2008

Month	*Index Price at Maturity Time*	Contract Execution	*HI LONG CALL*	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	Total
			Profit/Loss				
Jan	570.511	No	-20.379	16.773	10.944	-8.674	-1.336
Feb	573.347	No	-16.654	-16.041	10.467	-8.295	-30.523
Mar	511.987	1) Hi Long Call	-19.569	16.105	10.507	-8.327	-1.284
Apr	503.807	No	-17.482	14.387	9.387	-7.439	-1.147
May	513.062	No	-7.954	11.206	9.241	-7.324	5.169
Jun	503.936	1) Hi Long Call 2) Mid-Hi Short Call	-17.596	14.486	9.458	-7.499	-1.150
Jul	467.831	No	-17.374	14.310	9.351	-7.417	-1.130
Aug	449.362	No	-16.230	13.374	8.749	-6.943	-1.050
Sept	326.970	No	-15.599	12.855	8.410	-6.675	-1.009
Oct	241.352	No	-11.412	9.408	6.161	-4.892	-0.735
Nov	237.031	No	-9.293	7.671	5.036	-4.004	-0.590
Dec	290.869	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	45.407	-40.376	-40.376	38.350	3.003
TOTAL			-124.135	74.157	57.335	-39.140	-31.783
			-31.783 (**Loss**)				

Table 4.12 consists of 12 samples started from January till December within one month period of contract. The result from all those samples indicated

the loss of 31.783 index points to the investor. In the calculation from each month, the decreasing of current price index affected the profit and loss gain. The investor only gained profit in May and December 2008, and the number of profit was unable to cover all the losses. The biggest loss was in February, which the investor loss of 30.523 index points.

The loss experienced by the investor in one month contract was caused from the decrease of current index price which automatically followed by the position of *long call* and make the investor did not execute the contract. Meanwhile in *short call*, because of the decrease of current index price which make the investor did not execute the contract, gave profits caused from payment of call option price.

b)   *ROI in two months contract*

Table 4.13 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within two months period in 2008 by considering current index price and call option price.

Table 4.13 consists of 12 samples started from January till December within two months period of contract. The result from all those samples indicated the loss of 7.729 index points to the investor. Overall, the investor only made profit in April. The profit gained was unable to cover the loss experienced in the other 11 months. The loss gained by the investor is because the decreasing number of current index price. Although the number of loss is decreasing in *long*

call, but the profit that was gained from selling (*short call*) still can not cover the loss gained from buying (*long call*).

Two months contract in 2008 had resulted in the loss experienced by the investors. The total profit gained from short call was less than the loss suffered from long call caused by the call option price payment.

Table 4.13

ROI Using Condor Strategy with Two Months Contract on LQ45 Index in 2008

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	573.347	No	-29.928	26.222	19.794	-17.053	-0.966
Feb	511.987	No	-28.622	25.077	18.930	-16.309	-0.924
Mar	503.807	No	-28.789	25.225	19.043	-16.407	-0.928
Apr	513.062	1) Hi Long Call	-24.648	22.540	17.017	-14.662	0.246
May	503.936	1) Hi Long Call	-25.190	22.185	16.750	-14.433	-0.687
Jun	467.831	No	-25.944	22.741	17.183	-14.811	-0.831
Jul	449.362	No	-25.742	22.577	17.079	-14.730	-0.816
Aug	326.970	No	-24.111	21.157	16.021	-13.825	-0.758
Sept	262.084	No	-23.169	20.331	15.396	-13.286	-0.728
Oct	237.031	No	-16.944	14.872	11.269	-9.728	-0.530
Nov	290.869	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	14.910	-13.315	-9.694	7.675	-0.425
Dec	256.935	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	7.291	-5.854	-2.588	0.766	-0.384
TOTAL			-230.887	203.760	156.200	-136.803	-7.729
			-7.729 (**Loss**)				

c) *ROI in three months contract*

Table 4.14 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within three months period in 2008 by considering current index price and call option price.

Table 4.14

ROI Using Condor Strategy with Two Months Contract on LQ45 Index in 2008

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	511.987	No	-37.647	33.896	27.194	-24.232	-0.790
Feb	503.807	No	-36.004	32.416	26.006	-23.174	-0.756
Mar	513.062	No	-36.310	32.697	26.241	-23.387	-0.760
Apr	503.936	No	-32.451	29.223	23.454	-20.904	-0.678
May	467.831	No	-31.932	28.756	23.080	-20.570	-0.667
Jun	449.362	No	-32.788	29.537	23.725	-21.155	-0.679
Jul	326.970	No	-32.710	29.488	23.721	-21.167	-0.667
Aug	262.084	No	-30.702	27.692	22.300	-19.909	-0.619
Sept	237.031	No	-29.489	26.599	21.419	-19.123	-0.594
Oct	290.869	No	-21.527	19.420	15.643	-13.968	-0.432
Nov	256.935	No	-17.699	15.985	12.908	-11.540	-0.346
Dec	242.475	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	-10.672	12.080	15.210	-10.522	6.095
TOTAL			-349.932	317.789	260.901	-229.652	-0.894
			-0.894 **(Loss)**				

Table 4.14 consists of 12 samples started from January till December within three months period of contract. The result from all those samples indicated the loss of 0.894 index points to the investor. Overall, the investor only gained profit in December. However, the profit gained was unable to cover the loss experienced in the other 11 months. While the number of profit almost

covered the loss, but the condition still not support. This caused the high number of call option price, and became the reason that investor experienced loss. Different with one/two option contract, more time needed in make option contract means more money spent to make an option contract.

4.2.4.2 ROI of LQ45 Index Using Condor Strategy in 2009 (1, 2 and 3 motnhs)

a)   ROI in one month contract

Table 4.15 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within one month period in 2009 by considering current index price and call option price.

Table 4.15 consists of 12 samples started from January till December 2009 within one month period of contract. By the execution decision done by the investor, all of those samples gave profit of 4.273 of index point. The calculation from each month shows only 3 months benefited the investors; which were in June, November and December. In the other 9 months, the investors experienced loss. However, the profit gained in 3 months was greater than the loss experienced in the other 9 months.

Table 4.15

ROI Using Condor Strategy with One Month Contract on LQ45 Index in

2009

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	256.935	No	-17.019	15.285	12.205	-10.851	-0.380
Feb	242.475	No	-14.893	13.370	10.666	-9.479	-0.335
Mar	289.417	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	32.963	-31.364	-27.845	25.930	-0.316
Apr	342.783	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	36.755	-34.843	-30.632	28.342	-0.377
May	391.064	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	28.680	-26.410	-21.414	18.698	-0.447
Jun	400.125	1) Hi Long Call 2) Mid-Hi Short Call	-13.247	15.840	15.942	-14.156	4.378
Jul	458.634	1) Hi Long Call 2) Mid-Hi Short Call	35.744	-33.088	-27.242	24.064	-0.522
Aug	452.726	No	-26.062	23.376	18.615	-16.527	-0.598
Sept	486.452	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	8.024	-5.014	1.607	-5.206	-0.590
Oct	465.719	No	-27.597	24.751	19.707	-17.495	-0.634
Nov	484.828	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	-7.314	10.411	17.224	-16.751	3.570
Dec	507.914	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	-4.415	7.639	14.733	-17.434	0.524
TOTAL			31.621	-20.047	3.565	-10.865	4.273
			4.273 (**Profit**)				

The profit gained in investing option contract within one month period in 2009 came from investing in *long call* position. It gained profit because of the increase of current index price in 2009. Although in March, September and November the call option price decreased, it did not affect the increase of current index price in a year. Profit gained was also supported by the invesment in *short call* position with quite high *exercise price*; in which, the investor gain the profit from the payment of call option price.

However, in other condition investing in *short call* with slightly high *exercise price* suffered a loss and decrease the profit gained in *long call*. In the other hand, the number of profit gained by executing *long call* and the profit gained in *short call* with quite high *exercise price* was greater than the loss that came from investing in *short call* with slightly high *exercise price* and made the investors obtain profits.

b)   *ROI in two months contract*

Table 4.16 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within two months period in 2009 by considering current index price and call option price. Table 4.16 consists of 12 samples started from January till December 2009 within two months period of contract. By the execution decision done by the investor, all of those samples gave profit of 5.571 index point.

Table 4.16

ROI Using Condor Strategy with Two Months Contract on LQ45 Index in

2009

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	242.475	No	-24.785	23.047	19.844	-18.376	-0.269
Feb	289.417	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	10.848	-9.161	-5.546	3.621	-0.237
Mar	342.783	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	80.033	-78.435	-75.012	73.190	-0.224
Apr	391.064	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	77.602	-75.688	-71.589	69.408	-0.268
May	400.125	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	29.020	-26.747	-21.880	19.290	-0.317
Jun	458.634	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	35.444	-32.844	-27.276	24.313	-0.362
Jul	452.726	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	19.805	-17.141	-11.438	8.404	-0.370
Aug	486.452	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	-9.701	12.757	19.300	-22.781	-0.424
Sept	465.719	1) Hi Long Call 2) Mid-Hi Short Call	-23.992	27.011	29.490	-27.269	5.240
Oct	484.828	No	-39.705	36.870	31.656	-29.271	-0.450
Nov	507.914	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	4.171	-1.065	5.586	-9.124	-0.431

Dec	504.938	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	-19.466	22.701	29.625	-29.176	3.683
TOTAL			139.275	-118.696	-77.239	62.230	5.571
			5.571 **(Profit)**				

In the calculation from each month, only 2 months that gave the investor profits; which were in September and December. In the other 10 months, the investors experienced loss. However, the profit gained in those 2 months is greater than the loss experienced in the other 10 months.

The profit gained on option contract within two months period in 2009 was from *long call* position. This position gained profit because of the increase of current index price, meanwhile in September and November the call option price decreased but it did not affect the increase of current index price in a year.

The loss experienced in option contract within two months period was higher if compared with the option contract within one month period. It was caused by the more time in making contract will followed by the more price to make the contract. However, the increase of current index price in a year gave profits to the investor on option contract within two months period in 2009 than in one month contract. Even when investing in *short call* gives loss, it will not overcome the investor's profit by executing both of *long call* positions. So it will give higher profit to the investor compared with option contract in one month.

c)   *ROI in three months contract*

Table 4.17 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within three months period in 2009 by considering current index price and call option price.

Table 4.17 consists of 12 samples started from January till December 2009 within three months period of contract. By the execution decision done by the investor, all of those samples gave profit of 11.220 index point. In the calculation from each month, it shows only 3 months that gave the investor a profit which were in August, October and December. In the other 9 months, the investors experienced a loss. However, the profit gained in 3 months is greater if than the loss experienced in the other 9 months.

The loss experienced by investor on option contract within three months contract was higher because the payment of call option price which had more time in making option contract will be followed by more price to make the contract. The loss experienced in investing in *short call* was possible as those contracts were often executed and caused the investor experienced loss. When the increase of current index price on three months option contract was greater, and in some months the call option price decrease gave both of *long call* big profits. Because the investor gains greater profit than the loss experienced, automatically the profit can cover all of the losses experienced.

Table 4.17

ROI Using Condor Strategy with Three Months Contract on LQ45 Index in

2009

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	289.417	No	-31.022	29.291	26.049	-24.536	-0.218
Feb	342.783	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	58.803	-57.110	-53.528	51.642	-0.193
Mar	391.064	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	123.265	-121.661	-118.268	116.482	-0.182
Apr	400.125	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	80.721	-78.799	-74.735	72.595	-0.218
May	458.634	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	80.585	-78.301	-73.471	70.929	-0.258
Jun	452.726	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	21.820	-19.202	-13.667	10.754	-0.294
Jul	486.452	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	45.609	-42.929	-37.262	34.281	-0.301
Aug	465.719	1) Hi Long Call 2) Mid-Hi Short Call	-39.467	42.543	38.932	-36.621	5.387
Sept	484.828	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short	-13.765	16.804	23.228	-26.609	-0.341

		Call 4) Low Long Call					
Oct	507.914	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	-27.775	31.043	37.948	-38.722	2.494
Nov	504.938	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	-7.947	11.075	17.684	-21.162	-0.351
Dec	497.195	1) Hi Long Call 2) Mid-Hi Short Call	-36.729	39.985	41.052	-38.612	5.695
TOTAL			254.099	-227.262	-186.038	170.421	11.220
			11.220 (**Profit**)				

4.2.4.3 ROI of LQ45 Index using Condor Strategy in 2010 (1, 2 and 3 months)

a) *ROI in one month*

Table 4.18 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within one month period in 2010 by considering current index price and call option price.

Table 4.18 consists of 7 samples started from January till July 2010 within one month period of contract. By the execution decision done by the investor, all of those samples indicated the loss of 2.835 index point. In calculation from each month, almost in every month the investor experienced loss. However, in April the investor gained profit, and the profit gained by the investor was unable to cover all losses that happen in the other months.

The loss suffered by investor in one month contract was caused by the *long call* position which always experienced big loss. It happened because of the fluctuactive condition of current index price which affect to the *long call* position

oftenly not executed by the investor. Although they execute the *long call*, the purpose was still to cover the big payment of call option price. So the loss was caused by the big number of payment from call option price.

Table 4.18

ROI Using Condor Strategy with One Month Contract on LQ45 Index in

2010

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	504.938	No	-17.203	14.171	9.270	-7.360	-1.122
Feb	497.195	No	-17.100	14.086	9.215	-7.316	-1.115
Mar	550.380	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	36.356	-33.108	-25.472	21.127	-1.098
Apr	572.532	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	3.555	0.044	8.503	-7.950	4.152
May	527.276	No	-19.328	15.918	10.408	-8.261	-1.264
Jun	558.358	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	13.259	-9.812	-1.709	-2.902	-1.164
Jul	586.268	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call	9.046	-5.394	3.188	-8.064	-1.225
TOTAL			8.584	-4.095	13.402	-20.726	-2.835
			-2.835 **(Loss)**				

However, the profit was able to be gained through investing in short calls, but investor rarely executed it because of the fluactuactive condition in current index price on 2010. Even though gaining profit, the loss gained from paying call option price in *long call* was greater than the profit gained by payment of *call*

option price in *short call*. So, that condition still makes the investor experienced losses.

b)   *ROI in two months contract*

Table 4.19 will describe the return on investment in call option contract using *condor strategy* on LQ45 index within two months period in 2010 by considering current index price and call option price.

Table 4.19 consists of 7 samples started from January till July 2010 within two months period of contract. By the execution decision done by the investor, all of those samples caused loss of 7.931 index point. Overall, each month the investor experienced loss. The loss was affected by investing in *short call* which often resulted in big losses. Meanwhile in other position, investing in *long call* make the investor gain profits regarding the right to execute when the *call option price* increased, profit gained by investing in *long call* was still unable to cover the loss experienced by investing in *short call*. So the investor in option contract within two months period in 2010 still experienced loss.

Table 4.19

ROI Using Condor Strategy with Two Months Contract on LQ45 Index in

2010

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	497.195	No	-25.138	22.030	16.645	-14.350	-0.812
Feb	550.380	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	20.452	-17.229	-9.959	5.930	-0.807
Mar	572.532	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	50.743	-47.568	-40.408	36.439	-0.795
Apr	527.276	No	-27.253	23.885	18.048	-15.559	-0.880
May	558.358	No	-28.321	24.820	18.751	-16.165	-0.915
Jun	586.268	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	32.874	-29.510	-21.922	17.716	-0.843
Jul	593.383	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	7.439	-3.871	4.175	-8.634	-0.892
TOTAL			30.795	-27.443	-14.671	5.377	-5.943
			-5.943 (**Loss**)				

c)   *ROI in three months contract*

Table 4.20 will describe the return on invesment in call option contract

using *condor strategy* on LQ45 index within two months period in 2010 by

considering current index price and call option price. Table 4.20 consists of 7

samples started from January till July 2010 within three months period of

contract. By the execution decision done by the investor, all of those samples gave

profit of 9.166 index point. In calculation from each month, only 2 months from 7

months investor gained profits, which were in April and May. Meanwhile in the other 5 months, the investor experienced losses. However, the profit gained in two months was greater than total loss suffered in 5 months.

Table 4.20

ROI Using Condor Strategy with Three Months Contract on LQ45 Index in 2010

Month	*Index Price at Maturity Time*	Contract Execution	Profit/Loss				Total
			HI LONG CALL	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*	
Jan	550.380	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	10.910	-7.703	-0.614	-3.258	-0.665
Feb	572.532	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	36.216	-33.029	-25.982	22.133	-0.661
Mar	527.276	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	-0.809	3.948	10.887	-14.678	-0.651
Apr	558.358	1) Hi Long Call 2) Mid-Hi Short Call	-26.401	29.865	24.863	-22.168	6.159
May	586.268	1) Hi Long Call 2) Mid-Hi Short Call	-21.990	25.595	25.833	-23.032	6.407
Jun	593.383	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	33.165	-29.847	-22.509	18.501	-0.691
Jul	661.646	1) Hi Long Call 2) Mid-Hi Short Call 3) Mid-Low Short Call 4) Low Long Call	68.590	-65.066	-57.274	53.018	-0.731
TOTAL			99.681	-76.237	-44.796	30.517	9.166
			9.166 (**Profit**)				

The loss experienced by investors in three months contract was caused by the increase of *call option price*. Investors would experience loss when they invest in *short call*. Meanwhile the profit gained by doing option contract within three months period in 2010 was done through investing in *long call*. *Long call* position obtains profit because of the increase call option price in 2010, while in June 2010 *call option price* decreased but it did not affect the increasing of call option price in the other 7 months in 2010. So the loss occurred from investing in *short call* can be covered by the profit gained from investing in *long call*, and made the investor gain profit in option contract within three months period in 2010.
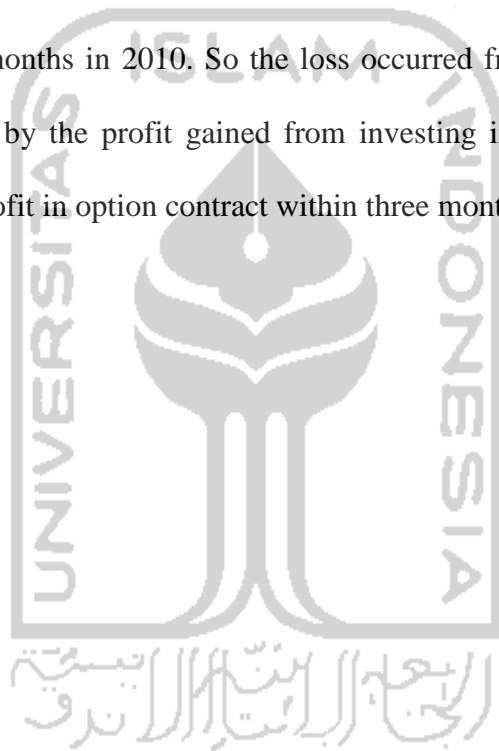
4.3   Research Implication

4.3.1   ROI Using Butterfly Strategy on LQ45 in 2008 – 2010

After defining the return on invesment by doing calculation in every year, the result will be summarized from 2008 to 2010. This calculation will show whether the investor gain profit or loss from making option contract.

a) ROI of one month contract in 2008 - 2010

Table 4.21 will describe the result of return on investment for one month contract in 2008 - 2010

Table 4.21

ROI for One Month Contract Option Using Butterfly Strategy on LQ45 in 2008-2010

Year	Profit/Loss
2008	-15.311
2009	6.459
2010	-5.590
TOTAL	**-14.442**

The result of return on invesment obtained from contract within one month period from 2008 till 2010 is -14.442 index points. It shows that the option contract in LQ45 index within one month period using *Butterfly Spread Strategy with Calls* in 2008 – 2010 made the investor suffer loss of 14.442 index points.

b) ROI of two months contract in 2008 - 2010

Table 4.22 will describe the result of return on invesment for one month contract in 2008 - 2010

Table 4.22

ROI for Two Months Contract Option Using Butterfly Strategy on LQ45 in

2008-2010

Year	Profit/Loss
2008	-10.719
2009	8.147
2010	-7.931
TOTAL	**-10.502**

The result of return on invesment obtained from contract within two months period from 2008 till 2010 is -10.502 index points. It shows that the option contract in LQ45 index within one month period by using *Butterfly Spread Strategy with Calls* in 2008 – 2010 made the investor experience loss of 10.502 index points.

c) ROI of three months contract in 2008 - 2010

Table 4.23 will describe the result of return on invesment for one month contract in 2008 - 2010

Table 4.23

ROI for Three Months Contract Option Using Butterfly Strategy on LQ45 in

2008-2010

Year	Profit/Loss
2008	-4.298
2009	17.241
2010	15.216
TOTAL	**28.159**

The result of return on invesment obtained from contract within three months period from 2008 till 2010 is 28.159 index points. It shows that the option contract in LQ45 index within one month period by using *Butterfly Spread Strategy with Calls* in 2008 – 2010 made the investor gain profit of 28.159 index points.

4.3.2   ROI Using Condor Strategy on LQ45 in 2008 – 2010

After defining the return on invesment by doing calculation in each year, the result will be summarized from 2008 to 2010. This calculation will show whether the investor gain profit or loss from making option contract.

a) ROI of one month contract in 2008 - 2010

Table 4.24 will describe the result of return on invesment for one month contract in 2008 - 2010

Table 4.24

ROI for One Month Contract Option Using Condor Strategy on LQ45 in

2008-2010

Year	Profit/Loss
2008	-31.783
2009	4.273
2010	-2.835
TOTAL	**-30.345**

The result of return on invesment obtained from contract within one month period from 2008 till 2010 is -30.345 index points. It shows that the option contract in LQ45 index within one month period by using *Condor Spread Strategy with Calls* in 2008 – 2010 made the investor experience loss of 30.345 index points.

b) ROI of two months contract in 2008 - 2010

Table 4.25 will describe the result of return on invesment for one month contract in 2008 - 2010

Table 4.25

ROI for Two Months Contract Option Using Condor Strategy on LQ45 in

2008-2010

Year	Profit/Loss
2008	-7.729
2009	5.571
2010	-5943
TOTAL	**-8.101**

The result of return on invesment obtained from contract within one month period from 2008 till 2010 is -8.101 index points. It shows that the option contract in LQ45 index within two months period by using *Condor Spread Strategy with Calls* in 2008 – 2010 made the investor experienced loss of 8.101 index points.

c) *ROI of three months contract in 2008 - 2010*

Table 4.26 will describe the result of return on invesment for one month contract in 2008 - 2010

Table 4.26

ROI for Three Months Contract Option Using Condor Strategy on LQ45 in

2008-2010

Year	Profit/Loss
2008	-0.894
2009	11.220
2010	9.166
TOTAL	**19.492**

The result of return on invesment was obtained from contract within one month period from 2008 till 2010 is 19.492 index points. It shows that the option contract in LQ45 index within three months period by using *Condor Spread Strategy with Calls* in 2008 – 2010 made the investor gain profit for 19.492 index points.

CHAPTER V

CONCLUCIONS AND RECOMMENDATIONS

5.1   Conclusions

This research focused on calculating ROI in LQ45 index by using two strategies *option contract* which were *Butterfly Spread with Calls Strategy* and *Condor Spread with Call Strategy*. This chapter will give some conclusions and recommendations based on the previous analysis. The results of analysis are as follows:

1.   The return on investment in option contract on LQ45 index within one, two, and three months in 2008 – 2010 by using *Butterfly Spread with Call Strategy* caused the investor loss for 14.442 in one month contract, loss for 10.512 in two months contract and profit for 28.159 in three months contract.

2.   The return on investment in option contract on LQ45 index within one, two, and three months in 2008 – 2010 by using *Condor Spread with Call Strategy* caused the investor loss for 30.345 in one month contract, loss for 8.101 in two months contract and profit for 19.492 in three months contract.

3.   Between *Butterfly Spread with Call Strategy* and *Condor Spread with Calls Strategy* there is a difference performance in terms gaining the return on investment (ROI).

4. The best strategy based on the return on investment of option contract in LQ 45 2008 – 2010 was *Butterfly Spread with Call Strategy*.

5.2 Recommendations

Based on the result of the research, some recommendation can be given by the researcher. They are listed below:

A. For Investors

1. If the investor is willing to invest in any other index with the same increasing of index value, where the low *exercise price* and high *exercise price* use the same value for both strategies, then the investor will be better using *Butterfly Spread with Call Strategy.*

2. Butterfly Spread with Call Strategy and Condor Spread with Call Strategy are better to use when the condition of index movements is unfluctuactive (the movements is not too extreme), whether the condition of index itself is strong or weak.

3. *Butterfly Spread with Call Strategy* is better than *Condor Spread with Call Strategy* if the investor wants to invest option contract in *long* and *short* at the same time, because investing two *short calls* with the same exercise price will give advantage than investing two *short calls* with different exercise price.

B.   For Further Researcher

1.   For further researcher it is possible to compare other
      application of strategy using different strategy, for example
      using *box strategy, bear and bull strategy* or the application
      of *ratio strategy.* And perhaps using different volatility
      approach by using applied *volatility.*

2.   Using another option type from this research by describing
      the application of *put option* using *Butterfly Strategy* and
      Condor Strategy.

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Appendix 1: Risk-free Interest Rate from SBI

1. Risk-free Interest Rate from SBI in 2008

1 Month	2 Months	3 Months
8.00%	7.92%	7.83%
8.00%	7.92%	7.83%
7.93%	7.97%	8.00%
7.96%	8.00%	8.04%
7.99%	8.02%	8.04%
8.31%	8.38%	8.44%
8.73%	8.97%	9.20%
9.23%	9.49%	9.74%
9.28%	9.51%	9.74%
9.71%	9.81%	9.90%
10.98%	11.07%	11.16%
11.24%	11.37%	11.50%

2. Risk-free Interest Rate from SBI in 2009

1 Month	2 Months	3 Months
10.83%	10.96%	11.08%
9.50%	9.72%	9.93%
8.74%	9.00%	9.25%
8.11%	8.34%	8.56%
7.59%	7.77%	7.95%
7.25%	7.18%	7.11%
6.88%	6.95%	7.01%
6.71%	6.75%	6.79%
6.58%	6.61%	6.63%
6.48%	6.52%	6.55%
6.49%	6.55%	6.60%
6.46%	6.53%	6.59%

3. Risk-free Interest Rate from SBI in 2010

1 Month	2 Months	3 Months
6.46%	6.53%	6.59%
6.45%	6.53%	6.60%
6.41%	6.50%	6.59%
6.27%	6.56%	6.85%
6.20%	6.50%	6.80%
6.30%	6.58%	6.86%
6.26%	6.43%	6.60%

Appendix 2: Call Option Price and Payoff Using Butterfly Strategy

1. Call option price and pay off from *Butterfly strategy* in 2008 one month contract

Month	Current Price	X_1	X_2	X_3	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
January	596.554	596.554	611.468	626.382	20.3794	13.6343	8.6740
February	570.511	570.511	584.774	599.037	19.4897	13.0391	8.2953
March	573.347	573.347	587.681	602.014	19.5694	13.0905	8.3268
April	511.987	511.987	524.787	537.586	17.4816	11.6947	7.4394
May	503.807	503.807	516.402	528.997	17.2088	11.5129	7.3242
June	513.062	513.062	525.889	538.715	17.5956	11.7792	7.4987
July	503.936	503.936	516.534	529.133	17.3739	11.6406	7.4172
August	467.831	467.831	479.527	491.223	16.2304	10.8853	6.9433
September	449.362	449.362	460.596	471.830	15.5994	10.4632	6.6748
October	326.970	326.970	335.144	343.319	11.4117	7.6609	4.8916
November	262.084	262.084	268.636	275.188	9.2926	6.2541	4.0041
December	237.031	237.031	242.957	248.883	8.4314	5.6775	3.6369

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-46.422	54.591	-64.545	N	N	N
-16.654	24.466	-33.985	Y	N	N
-80.929	88.784	-98.354	N	N	N
-25.662	32.674	-41.219	N	N	N
-7.954	14.853	-23.260	Y	N	N
-26.722	33.732	-42.278	N	N	N
-53.479	60.344	-68.719	N	N	N
-34.699	41.050	-48.804	N	N	N
-137.991	144.089	-151.535	N	N	N
-76.298	80.721	-86.126	N	N	N
-34.346	37.859	-42.161	N	N	N
45.407	-42.235	38.350	Y	Y	Y

2. Call option price and pay off from *Butterfly strategy* in 2008 two months
contract

Month	*Current Price*	X_1	X_2	X_3	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	596.554	596.554	611.468	626.382	29.9282	22.8464	17.0533
February	570.511	570.511	584.774	599.037	28.6216	21.8490	16.3088
March	573.347	573.347	587.681	602.014	28.7888	21.9787	16.4073
April	511.987	511.987	524.787	537.586	25.7233	19.6397	14.6623
May	503.807	503.807	516.402	528.997	25.3189	19.3315	14.4327
June	513.062	513.062	525.889	538.715	25.9444	19.8231	14.8105
July	503.936	503.936	516.534	529.133	25.7423	19.6913	14.7298
August	467.831	467.831	479.527	491.223	24.1113	18.4624	13.8251
September	449.362	449.362	460.596	471.830	23.1693	17.7420	13.2863
October	326.970	326.970	335.144	343.319	16.9437	12.9821	9.7276
November	262.084	262.084	268.636	275.188	13.8755	10.6574	8.0061
December	237.031	237.031	242.957	248.883	12.6127	9.6930	7.2861

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-53.135	60.967	-70.088	N	N	N
-87.146	94.636	-103.358	N	N	N
-98.329	105.852	-114.615	N	N	N
-24.648	31.364	-39.187	Y	N	N
-25.190	31.798	-39.494	Y	N	N
-71.175	77.881	-85.695	N	N	N
-80.316	86.864	-94.501	N	N	N
-164.972	171.019	-178.078	N	N	N
-210.447	216.254	-223.032	N	N	N
-106.883	111.095	-116.015	N	N	N
14.910	-11.576	7.675	Y	Y	Y
7.291	-4.285	0.766	Y	Y	Y

3. Call option price and pay off from *Butterfly strategy* in 2008 three months contract

Month	*Current Price*	X_1	X_2	X_3	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	596.554	596.554	611.468	626.382	37.6475	30.4125	24.2320
February	570.511	570.511	584.774	599.037	36.0039	29.0848	23.1741
March	573.347	573.347	587.681	602.014	36.3101	29.3418	23.3868
April	511.987	511.987	524.787	537.586	32.4509	26.2252	20.9044
May	503.807	503.807	516.402	528.997	31.9324	25.8062	20.5704
June	513.062	513.062	525.889	538.715	32.7878	26.5179	21.1545
July	503.936	503.936	516.534	529.133	32.7095	26.4932	21.1667
August	467.831	467.831	479.527	491.223	30.7015	24.8925	19.9090
September	449.362	449.362	460.596	471.830	29.4895	23.9098	19.1230
October	326.970	326.970	335.144	343.319	21.5272	17.4594	13.9684
November	262.084	262.084	268.636	275.188	17.6989	14.3889	11.5404
December	237.031	237.031	242.957	248.883	16.1163	13.1106	10.5222

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-122.214	129.893	-138.627	N	N	N
-102.708	110.052	-118.404	N	N	N
-96.595	103.960	-112.339	N	N	N
-40.502	47.076	-54.555	N	N	N
-67.908	74.377	-81.737	N	N	N
-96.488	103.044	-110.508	N	N	N
-209.676	216.058	-223.329	N	N	N
-236.449	242.335	-249.048	N	N	N
-241.820	247.475	-253.922	N	N	N
-57.628	61.735	-66.418	N	N	N
-22.848	26.090	-29.794	N	N	N
-10.672	13.592	-16.930	Y	N	N

4. Call option price and pay off from *Butterfly strategy* in 2009 one month contract

Month	*Current Price*	X₁	X₂	X₃	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	290.869	290.8690	298.1407	305.4125	17.0187	13.6814	10.8505
February	256.935	256.9350	263.3584	269.7818	14.8927	11.9620	9.4786
March	242.475	242.4750	248.5369	254.5988	13.9790	11.2227	8.8883
April	289.417	289.4170	296.6524	303.8879	16.6108	13.3301	10.5530
May	342.783	342.7830	351.3526	359.9222	19.6010	15.7245	12.4442
June	391.064	391.0640	400.8406	410.6172	22.3078	17.8920	14.1563
July	400.125	400.1250	410.1281	420.1313	22.7645	18.2539	14.4392
August	458.634	458.6340	470.0999	481.5657	26.0616	20.8955	16.5268
September	452.726	452.7260	464.0442	475.3623	25.7021	20.6055	16.2960
October	486.452	486.4520	498.6133	510.7746	27.5970	22.1232	17.4952
November	465.719	465.7190	477.3620	489.0050	26.4227	21.1820	16.7510
December	484.828	484.8280	496.9487	509.0694	27.5010	22.0459	17.4339

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-50.953	54.887	-59.328	N	N	N
-29.353	32.845	-36.785	N	N	N
32.963	-29.657	25.930	Y	Y	Y
36.755	-32.800	28.342	Y	Y	Y
28.680	-23.987	18.698	Y	Y	Y
-13.247	18.608	-24.649	Y	N	N
35.744	-30.252	24.064	Y	Y	Y
-31.970	38.269	-45.367	N	N	N
8.024	-1.802	-5.206	Y	Y	Y
-48.330	55.018	-62.551	N	N	N
-7.314	13.716	-20.928	Y	Y	N
-4.415	11.081	-18.589	Y	Y	N

5. Call option price and pay off from *Butterfly strategy* in 2009 two months contract

Month	*Current Price*	X_1	X_2	X_3	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	290.869	290.8690	298.1407	305.4125	24.7850	21.4011	18.3755
February	256.935	256.9350	263.3584	269.7818	21.6337	18.6655	16.0140
March	242.475	242.4750	248.5369	254.5988	20.2746	17.4849	14.9942
April	289.417	289.4170	296.6524	303.8879	24.0454	20.7282	17.7679
May	342.783	342.7830	351.3526	359.9222	28.3218	24.4058	20.9126
June	391.064	391.0640	400.8406	410.6172	32.1257	27.6734	23.7035
July	400.125	400.1250	410.1281	420.1313	32.7963	28.2469	24.1912
August	458.634	458.6340	470.0999	481.5657	37.5186	32.3101	27.6674
September	452.726	452.7260	464.0442	475.3623	36.9847	31.8474	27.2687
October	486.452	486.4520	498.6133	510.7746	39.7049	34.1878	29.2710
November	465.719	465.7190	477.3620	489.0050	38.0238	32.7409	28.0327
December	484.828	484.8280	496.9487	509.0694	39.5762	34.0772	29.1765

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-73.179	77.067	-81.313	N	N	N
10.848	-7.393	3.621	Y	Y	Y
80.033	-76.761	73.190	Y	Y	Y
77.602	-73.683	69.408	Y	Y	Y
29.020	-24.367	19.290	Y	Y	Y
35.444	-30.120	24.313	Y	Y	Y
19.805	-14.351	8.404	Y	Y	Y
-9.701	15.958	-22.781	Y	Y	Y
-23.992	30.173	-36.912	Y	Y	N
-41.329	47.973	-55.218	N	N	N
4.171	2.189	-9.124	Y	Y	Y
-19.466	26.088	-33.308	Y	Y	N

6. Call option price and pay off from *Butterfly strategy* in 2009 three months contract

Month	*Current Price*	X₁	X₂	X₃	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	290.869	290.8690	298.1407	305.4125	31.0218	27.6334	24.5358
February	256.935	256.9350	263.3584	269.7818	27.0445	24.0733	21.3593
March	242.475	242.4750	248.5369	254.5988	25.3237	22.5320	19.9832
April	289.417	289.4170	296.6524	303.8879	29.9866	26.6693	23.6422
May	342.783	342.7830	351.3526	359.9222	35.2658	31.3525	27.7831
June	391.064	391.0640	400.8406	410.6172	39.8420	35.4022	31.3550
July	400.125	400.1250	410.1281	420.1313	40.7177	36.1780	32.0401
August	458.634	458.6340	470.0999	481.5657	46.5521	41.3561	36.6209
September	452.726	452.7260	464.0442	475.3623	45.8667	40.7431	36.0744
October	486.452	486.4520	498.6133	510.7746	49.2375	43.7351	38.7216
November	465.719	465.7190	477.3620	489.0050	47.1665	41.8969	37.0953
December	484.828	484.8280	496.9487	509.0694	49.0960	43.6106	38.6123

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-32.474	36.357	-40.531	N	N	N
58.803	-55.351	51.642	Y	Y	Y
123.265	-119.995	116.482	Y	Y	Y
80.721	-76.803	72.595	Y	Y	Y
80.585	-75.929	70.929	Y	Y	Y
21.820	-16.483	10.754	Y	Y	Y
45.609	-40.146	34.281	Y	Y	Y
-39.467	45.737	-52.468	Y	N	N
-13.765	19.959	-26.609	Y	Y	Y
-27.775	34.434	-41.582	Y	Y	N
-7.947	14.321	-21.162	Y	Y	Y
-36.729	43.364	-50.487	Y	Y	N

7. Call option price and pay off from *Butterfly strategy* in 2010 one month contract

Month	*Current Price*	X_1	X_2	X_3	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	507.914	507.914	520.612	533.310	17.2030	11.5325	7.3600
February	504.938	504.938	517.561	530.185	17.1000	11.4632	7.3157
March	497.195	497.195	509.625	522.055	16.8294	11.2809	7.1987
April	550.380	550.380	564.140	577.899	18.5969	12.4623	7.9503
May	572.532	572.532	586.845	601.159	19.3284	12.9507	8.2607
June	527.276	527.276	540.458	553.640	17.8230	11.9443	7.6203
July	558.358	558.358	572.317	586.276	18.8641	12.6411	8.0642

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-20.179	27.206	-35.732	N	N	N
-24.843	31.830	-40.306	N	N	N
36.356	-29.474	21.127	Y	Y	Y
3.555	-4.070	-13.317	Y	Y	N
-64.584	72.520	-82.143	N	N	N
13.259	-5.956	-2.902	Y	Y	Y
9.046	-1.310	-8.072	Y	Y	N

8. Call option price and pay off from *Butterfly strategy* in 2010 two months contract

Month	*Current Price*	X_1	X_2	X_3	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	507.914	507.914	520.612	533.310	25.1375	19.2019	14.3496
February	504.938	504.938	517.561	530.185	24.9902	19.0894	14.2655
March	497.195	497.195	509.625	522.055	24.5943	18.7859	14.0379
April	550.380	550.380	564.140	577.899	27.2533	20.8193	15.5592
May	572.532	572.532	586.845	601.159	28.3209	21.6324	16.1649
June	527.276	527.276	540.458	553.640	26.1183	19.9530	14.9124
July	558.358	558.358	572.317	586.276	27.5865	21.0686	15.7414

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
-35.857	42.619	-50.464	N	N	N
20.452	-13.729	5.930	Y	Y	Y
50.743	-44.121	36.439	Y	Y	Y
-50.357	57.683	-66.182	N	N	N
-42.495	50.120	-58.966	N	N	N
32.874	-25.857	17.716	Y	Y	Y
7.439	0.003	-8.634	Y	Y	Y

9. Call option price and pay off from *Butterfly strategy* in 2010 three months contract

Month	*Current Price*	X₁	X₂	X₃	*HI LONG CALL*	*MID SHORT CALL*	*LOW LONG CALL*
January	507.914	507.914	520.612	533.310	31.5564	25.4983	20.3278
February	504.938	504.938	517.561	530.185	31.3780	25.3546	20.2137
March	497.195	497.195	509.625	522.055	30.8904	24.9602	19.8988
April	550.380	550.380	564.140	577.899	34.3786	27.7925	22.1681
May	572.532	572.532	586.845	601.159	35.7255	28.8786	23.0321
June	527.276	527.276	540.458	553.640	32.9423	26.6318	21.2427
July	558.358	558.358	572.317	586.276	34.6976	28.0370	22.3522

PAYOFF			EXECUTION		
HI LONG CALL	MID SHORT CALL	LOW LONG CALL	HI LONG CALL	MID SHORT CALL	LOW LONG CALL
10.910	-4.270	-3.258	Y	Y	Y
36.216	-29.616	22.133	Y	Y	Y
-0.809	7.309	-14.678	Y	Y	Y
-26.401	33.574	-41.709	Y	N	N
-21.990	29.456	-37.923	Y	N	N
33.165	-26.293	18.501	Y	Y	Y
68.590	-61.292	53.018	Y	Y	Y

Appendix 3: Call Option Price and Payoff Using Condor Strategy

1. Call option price and pay off from *Condor strategy* in 2008 one month contract

Month	Current Price	X₁	X₂	X₃	X₄	HI LONG CALL	MID-HI SHORT CALL	MID-LOW SHORT CALL	LOW LONG CALL
Jan	596.554	596.554	604.011	618.925	626.382	20.379	16.773	10.944	8.674
Feb	570.511	570.511	577.642	591.905	599.037	19.490	16.041	10.467	8.295
Mar	573.347	573.347	580.514	594.848	602.014	19.569	16.105	10.507	8.327
Apr	511.987	511.987	518.387	531.187	537.586	17.482	14.387	9.387	7.439
May	503.807	503.807	510.105	522.700	528.997	17.209	14.163	9.241	7.324
Jun	513.062	513.062	519.475	532.302	538.715	17.596	14.486	9.458	7.499
Jul	503.936	503.936	510.235	522.834	529.133	17.374	14.310	9.351	7.417
Aug	467.831	467.831	473.679	485.375	491.223	16.230	13.374	8.749	6.943
Sep	449.362	449.362	454.979	466.213	471.830	15.599	12.855	8.410	6.675
Oct	326.970	326.970	331.057	339.231	343.319	11.412	9.408	6.161	4.892
Nov	262.084	262.084	265.360	271.912	275.188	9.293	7.671	5.036	4.004
Dec	237.031	237.031	239.994	245.920	248.883	8.431	6.961	4.573	3.637

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-46.422	50.273	59.358	-64.545	N	N	N	N
-16.654	20.336	29.025	-33.985	Y	N	N	N
-80.929	84.632	93.368	-98.354	N	N	N	N
-25.662	28.967	36.767	-41.219	N	N	N	N
-7.954	11.206	18.879	-23.260	Y	Y	N	N
-26.722	30.025	37.824	-42.278	N	N	N	N
-53.479	56.714	64.354	-68.719	N	N	N	N
-34.699	37.691	44.762	-48.804	N	N	N	N
-137.991	140.864	147.653	-151.535	N	N	N	N
-97.030	99.113	104.040	-106.858	N	N	N	N
-34.346	36.000	39.917	-42.161	N	N	N	N
45.407	-43.914	-40.376	38.350	Y	Y	Y	Y

2. Call option price and pay off from *Condor strategy* in 2008 two months contract

Month	*Current Price*	X_1	X_2	X_3	X_4	*HI LONG CALL*	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*
Jan	596.554	596.554	604.011	618.925	626.382	29.928	26.222	19.794	17.053
Feb	570.511	570.511	577.642	591.905	599.037	28.622	25.077	18.930	16.309
Mar	573.347	573.347	580.514	594.848	602.014	28.789	25.225	19.043	16.407
Apr	511.987	511.987	518.387	531.187	537.586	25.723	22.540	17.017	14.662
May	503.807	503.807	510.105	522.700	528.997	25.319	22.185	16.750	14.433
Jun	513.062	513.062	519.475	532.302	538.715	25.944	22.741	17.183	14.811
Jul	503.936	503.936	510.235	522.834	529.133	25.742	22.577	17.079	14.730
Aug	467.831	467.831	473.679	485.375	491.223	24.111	21.157	16.021	13.825
Sep	449.362	449.362	454.979	466.213	471.830	23.169	20.331	15.396	13.286
Oct	326.970	326.970	331.057	339.231	343.319	16.944	14.872	11.269	9.728
Nov	262.084	262.084	265.360	271.912	275.188	13.875	12.194	9.263	8.006
Dec	237.031	237.031	239.994	245.920	248.883	12.613	11.087	8.427	7.286

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-53.135	56.886	65.372	-70.088	N	N	N	N
-87.146	90.732	98.848	-103.358	N	N	N	N
-98.329	101.932	110.084	-114.615	N	N	N	N
-24.648	27.864	35.142	-39.187	Y	N	N	N
-25.190	28.354	35.514	-39.494	Y	N	N	N
-71.175	74.386	81.653	-85.695	N	N	N	N
-80.316	83.450	90.550	-94.501	N	N	N	N
-164.972	167.866	174.426	-178.078	N	N	N	N
-210.447	213.226	219.525	-223.032	N	N	N	N
-106.883	108.899	113.469	-116.015	N	N	N	N
14.910	-13.315	-9.694	7.675	Y	Y	Y	Y
7.291	-5.854	-2.588	0.766	Y	Y	Y	Y

3. Call option price and pay off from *Condor strategy* in 2008 three months contract

Month	Current Price	X₁	X₂	X₃	X₄	HI LONG CALL	MID-HI SHORT CALL	MID-LOW SHORT CALL	LOW LONG CALL
Jan	596.554	596.554	604.011	618.925	626.382	37.647	33.896	27.194	24.232
Feb	570.511	570.511	577.642	591.905	599.037	36.004	32.416	26.006	23.174
Mar	573.347	573.347	580.514	594.848	602.014	36.310	32.697	26.241	23.387
Apr	511.987	511.987	518.387	531.187	537.586	32.451	29.223	23.454	20.904
May	503.807	503.807	510.105	522.700	528.997	31.932	28.756	23.080	20.570
Jun	513.062	513.062	519.475	532.302	538.715	32.788	29.537	23.725	21.155
Jul	503.936	503.936	510.235	522.834	529.133	32.710	29.488	23.721	21.167
Aug	467.831	467.831	473.679	485.375	491.223	30.702	27.692	22.300	19.909
Sep	449.362	449.362	454.979	466.213	471.830	29.489	26.599	21.419	19.123
Oct	326.970	326.970	331.057	339.231	343.319	21.527	19.420	15.643	13.968
Nov	262.084	262.084	265.360	271.912	275.188	17.699	15.985	12.908	11.540
Dec	237.031	237.031	239.994	245.920	248.883	16.116	14.561	11.765	10.522

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-122.214	125.919	134.131	-138.627	N	N	N	N
-102.708	106.251	114.105	-118.404	N	N	N	N
-96.595	100.149	108.026	-112.339	N	N	N	N
-40.502	43.674	50.705	-54.555	N	N	N	N
-67.908	71.029	77.948	-81.737	N	N	N	N
-96.488	99.651	106.665	-110.508	N	N	N	N
-209.676	212.753	219.585	-223.329	N	N	N	N
-236.449	239.287	245.590	-249.048	N	N	N	N
-241.820	244.547	250.601	-253.922	N	N	N	N
-57.628	59.608	64.006	-66.418	N	N	N	N
-22.848	24.410	27.885	-29.794	N	N	N	N
-10.672	12.080	15.210	-16.930	Y	Y	Y	N

4. Call option price and pay off from *Condor strategy* in 2009 one month contract

Month	Current Price	X₁	X₂	X₃	X₄	HI LONG CALL	MID-HI SHORT CALL	MID-LOW SHORT CALL	LOW LONG CALL
Jan	290.869	290.869	294.505	301.777	305.412	17.019	15.285	12.205	10.851
Feb	256.935	256.935	260.147	266.570	269.782	14.893	13.370	10.666	9.479
Mar	242.475	242.475	245.506	251.568	254.599	13.979	12.547	10.004	8.888
Apr	289.417	289.417	293.035	300.270	303.888	16.611	14.906	11.881	10.553
May	342.783	342.783	347.068	355.637	359.922	19.601	17.586	14.012	12.444
Jun	391.064	391.064	395.952	405.729	410.617	22.308	20.012	15.942	14.156
Jul	400.125	400.125	405.127	415.130	420.131	22.765	20.420	16.262	14.439
Aug	458.634	458.634	464.367	475.833	481.566	26.062	23.376	18.615	16.527
Sep	452.726	452.726	458.385	469.703	475.362	25.702	23.052	18.356	16.296
Oct	486.452	486.452	492.533	504.694	510.775	27.597	24.751	19.707	17.495
Nov	465.719	465.719	471.540	483.183	489.005	26.423	23.698	18.869	16.751
Dec	484.828	484.828	490.888	503.009	509.069	27.501	24.665	19.638	17.434

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-50.953	52.855	57.046	-59.328	N	N	N	N
-29.353	31.042	34.761	-36.785	N	N	N	N
32.963	-31.364	-27.845	25.930	Y	Y	Y	Y
36.755	-34.843	-30.632	28.342	Y	Y	Y	Y
28.680	-26.410	-21.414	18.698	Y	Y	Y	Y
-13.247	15.840	21.546	-24.649	Y	Y	N	N
35.744	-33.088	-27.242	24.064	Y	Y	Y	Y
-31.970	35.017	41.721	-45.367	N	N	N	N
8.024	-5.014	1.607	-5.206	Y	Y	Y	Y
-48.330	51.565	58.682	-62.551	N	N	N	N
-7.314	10.411	17.224	-20.928	Y	Y	Y	N
-4.415	7.639	14.733	-18.589	Y	Y	Y	N

5. Call option price and pay off from *Condor strategy* in 2009 two months contract

Month	*Current Price*	X_1	X_2	X_3	X_4	*HI LONG CALL*	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*
Jan	290.869	290.869	294.505	301.777	305.412	24.785	23.047	19.844	18.376
Feb	256.935	256.935	260.147	266.570	269.782	21.634	20.109	17.301	16.014
Mar	242.475	242.475	245.506	251.568	254.599	20.275	18.842	16.203	14.994
Apr	289.417	289.417	293.035	300.270	303.888	24.045	22.341	19.204	17.768
May	342.783	342.783	347.068	355.637	359.922	28.322	26.310	22.608	20.913
Jun	391.064	391.064	395.952	405.729	410.617	32.126	29.838	25.630	23.704
Jul	400.125	400.125	405.127	415.130	420.131	32.796	30.459	26.159	24.191
Aug	458.634	458.634	464.367	475.833	481.566	37.519	34.842	29.920	27.667
Sep	452.726	452.726	458.385	469.703	475.362	36.985	34.345	29.490	27.269
Oct	486.452	486.452	492.533	504.694	510.775	39.705	36.870	31.656	29.271
Nov	465.719	465.719	471.540	483.183	489.005	38.024	35.309	30.317	28.033
Dec	484.828	484.828	490.888	503.009	509.069	39.576	36.750	31.554	29.176

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-73.179	75.077	79.146	-81.313	N	N	N	N
10.848	-9.161	-5.546	3.621	Y	Y	Y	Y
80.033	-78.435	-75.012	73.190	Y	Y	Y	Y
77.602	-75.688	-71.589	69.408	Y	Y	Y	Y
29.020	-26.747	-21.880	19.290	Y	Y	Y	Y
35.444	-32.844	-27.276	24.313	Y	Y	Y	Y
19.805	-17.141	-11.438	8.404	Y	Y	Y	Y
-9.701	12.757	19.300	-22.781	Y	Y	Y	Y
-23.992	27.011	33.474	-36.912	Y	Y	N	N
-41.329	44.574	51.522	-55.218	N	N	N	N
4.171	-1.065	5.586	-9.124	Y	Y	Y	Y
-19.466	22.701	29.625	-33.308	Y	Y	Y	N

6. Call option price and pay off from *Condor strategy* in 2009 three months contract

Month	Current Price	X_1	X_2	X_3	X_4	HI LONG CALL	MID-HI SHORT CALL	MID-LOW SHORT CALL	LOW LONG CALL
Jan	290.869	290.869	294.505	301.777	305.412	31.022	29.291	26.049	24.536
Feb	256.935	256.935	260.147	266.570	269.782	27.045	25.526	22.685	21.359
Mar	242.475	242.475	245.506	251.568	254.599	25.324	23.897	21.228	19.983
Apr	289.417	289.417	293.035	300.270	303.888	29.987	28.291	25.120	23.642
May	342.783	342.783	347.068	355.637	359.922	35.266	33.265	29.526	27.783
Jun	391.064	391.064	395.952	405.729	410.617	39.842	37.572	33.331	31.355
Jul	400.125	400.125	405.127	415.130	420.131	40.718	38.397	34.060	32.040
Aug	458.634	458.634	464.367	475.833	481.566	46.552	43.895	38.932	36.621
Sep	452.726	452.726	458.385	469.703	475.362	45.867	43.247	38.353	36.074
Oct	486.452	486.452	492.533	504.694	510.775	49.237	46.424	41.169	38.722
Nov	465.719	465.719	471.540	483.183	489.005	47.166	44.472	39.439	37.095
Dec	484.828	484.828	490.888	503.009	509.069	49.096	46.291	41.052	38.612

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-32.474	34.379	38.408	-40.531	N	N	N	N
58.803	-57.110	-53.528	51.642	Y	Y	Y	Y
123.265	-121.661	-118.268	116.482	Y	Y	Y	Y
80.721	-78.799	-74.735	72.595	Y	Y	Y	Y
80.585	-78.301	-73.471	70.929	Y	Y	Y	Y
21.820	-19.202	-13.667	10.754	Y	Y	Y	Y
45.609	-42.929	-37.262	34.281	Y	Y	Y	Y
-39.467	42.543	49.046	-52.468	Y	Y	N	N
-13.765	16.804	23.228	-26.609	Y	Y	Y	Y
-27.775	31.043	37.948	-41.582	Y	Y	Y	T
-7.947	11.075	17.684	-21.162	Y	Y	Y	Y
-36.729	39.985	46.866	-50.487	Y	Y	N	N

7. Call option price and pay off from *Condor strategy* in 2010 one month contract

Month	Current Price	X₁	X₂	X₃	X₄	HI LONG CALL	MID-HI SHORT CALL	MID-LOW SHORT CALL	LOW LONG CALL
Jan	507.914	507.914	514.263	526.961	533.310	17.203	14.171	9.270	7.360
Feb	504.938	504.938	511.250	523.873	530.185	17.100	14.086	9.215	7.316
Mar	497.195	497.195	503.410	515.840	522.055	16.829	13.862	9.068	7.199
Apr	550.380	550.380	557.260	571.019	577.899	18.597	15.316	10.016	7.950
May	572.532	572.532	579.689	594.002	601.159	19.328	15.918	10.408	8.261
Jun	527.276	527.276	533.867	547.049	553.640	17.823	14.679	9.600	7.620
Jul	558.358	558.358	565.337	579.296	586.276	18.864	15.536	10.159	8.064

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-20.179	23.496	31.293	-35.732	N	N	N	N
-24.843	28.141	35.893	-40.306	N	N	N	N
36.356	-33.108	-25.472	21.127	Y	Y	Y	Y
3.555	0.044	8.503	-13.317	Y	Y	Y	N
-64.584	68.330	77.134	-82.143	N	N	N	N
13.259	-9.812	-1.709	-2.902	Y	Y	Y	Y
9.046	-5.394	3.188	-8.072	Y	Y	Y	N

8. Call option price and pay off from *Condor strategy* in 2010 two months contract

Month	*Current Price*	X₁	X₂	X₃	X₄	*HI LONG CALL*	*MID-HI SHORT CALL*	*MID-LOW SHORT CALL*	*LOW LONG CALL*
Jan	507.914	507.914	514.263	526.961	533.310	25.138	22.030	16.645	14.350
Feb	504.938	504.938	511.250	523.873	530.185	24.990	21.901	16.548	14.266
Mar	497.195	497.195	503.410	515.840	522.055	24.594	21.554	16.284	14.038
Apr	550.380	550.380	557.260	571.019	577.899	27.253	23.885	18.048	15.559
May	572.532	572.532	579.689	594.002	601.159	28.321	24.820	18.751	16.165
Jun	527.276	527.276	533.867	547.049	553.640	26.118	22.891	17.297	14.912
Jul	558.358	558.358	565.337	579.296	586.276	27.586	24.174	18.261	15.741

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
-35.857	39.098	46.411	-50.464	N	N	N	N
20.452	-17.229	-9.959	5.930	Y	Y	Y	Y
50.743	-47.568	-40.408	36.439	Y	Y	Y	Y
-50.357	53.869	61.791	-66.182	N	N	N	N
-42.495	46.150	54.395	-58.966	N	N	N	N
32.874	-29.510	-21.922	17.716	Y	Y	Y	Y
7.439	-3.871	4.175	-8.634	Y	Y	Y	Y

9. Call option price and pay off from *Condor strategy* in 2010 three months contract

Month	Current Price	X₁	X₂	X₃	X₄	HI LONG CALL	MID-HI SHORT CALL	MID-LOW SHORT CALL	LOW LONG CALL
Jan	507.914	507.914	514.263	526.961	533.310	31.556	28.414	22.805	20.328
Feb	504.938	504.938	511.250	523.873	530.185	31.378	28.254	22.677	20.214
Mar	497.195	497.195	503.410	515.840	522.055	30.890	27.814	22.324	19.899
Apr	550.380	550.380	557.260	571.019	577.899	34.379	30.963	24.863	22.168
May	572.532	572.532	579.689	594.002	601.159	35.726	32.174	25.833	23.032
Jun	527.276	527.276	533.867	547.049	553.640	32.942	29.669	23.825	21.243
Jul	558.358	558.358	565.337	579.296	586.276	34.698	31.243	25.076	22.352

PAYOFF				EXECUTION			
HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL	HI LONG CALL	MID-HI SHORT CALL	MID LOW SHORT CALL	LOW LONG CALL
10.910	-7.703	-0.614	-3.258	Y	Y	Y	Y
36.216	-33.029	-25.982	22.133	Y	Y	Y	Y
-0.809	3.948	10.887	-14.678	Y	Y	Y	Y
-26.401	29.865	37.524	-41.709	Y	Y	N	N
-21.990	25.595	33.567	-37.923	Y	Y	N	N
33.165	-29.847	-22.509	18.501	Y	Y	Y	Y
68.590	-65.066	-57.274	53.018	Y	Y	Y	Y