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AN ALTERNATIVE OPTION STRATEGY "VOLATILITY HUNTER"

(Yüksek Lisans Tezi)

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ABSTRACT

Based upon the experience that we have gained in more than a decade with the financial crisis; one of the essential need of the Turkish markets is to have financial tools which protects the companies and the people from exchange rate fluctuations. The issue has become again a hot topic recently as there could emerge another exchange rate fluctuation, comments are in highlights due to high volume credits of especially reel sector in foreign currency and current account deficit. Need is very obvious and to stabilize & deepen the currency market seems very essential. The purpose of this study is to test an alternative financial strategy that provides market subjects to gain from exchange rate volatility in volatile market. The alternative financial strategy is an option trading strategy " The Volatility Hunter " with three versions; Rabbit, Duck and Deer all bet on the volatility of Turkish Lira and Dollar parity. Versions are produced for different risk taking behaviors and loss or profit goes up from Rabbit to Deer.

The last two global crises (May 2006 & August 2007) in financial markets that lived have shown one more time the necessity of having developed financial tools for equilibrium in market. To have a stabilized economy and financial markets; more complicated and internationally used financial tools should take their seats in our markets in short-term and government should support and encourage this improvement to be an international competitor, to deepen our financial markets. And to support this process, academicians should study on Turkish markets cases of internationally used financial tools.

Keywords: TURKDEX; Options; Options strategy; Volatility in currency market

ÖZET

Son 10 yıldan uzun bir süredir yaşadığımız ekonomik krizlerden edindiğimiz deneyimlere dayanarak; Türkiye'deki piyasaların temel ihtiyaçlarından birinin, kişi ve şirketleri döviz kurlarındaki dalgalanmalardan koruyacak finansal araçlar geliştirmek olduğunu söyleyebiliriz. Bu konu, döviz kurlarındaki yeni bir dalgalanma ile tekrar son günlerin en önemli başlıklarından biri oldu ve konu ile ilgili yorumlar, özellikle de yüksek miktarda döviz borcu ve cari açığı bulunan reel sektör nedeniyle, haber başlıklarında yerini aldı. Söz konusu ihtiyaç ve döviz piyasasının stabilizasyonu ve kuvvetlendirilmesi gereksinimi çok açık ve gerekli görünüyor. Bu çalışmanın amacı, piyasa oyuncularını dalgalı piyasalarda "döviz kuru dalgalanmaları"ndan kazanç sağlaması için alternatif bir finansal strateji test etmektir. Söz konusu alternatif strateji, her biri ayrı ayrı YTL ve USD paritesindeki dalgalanmalar üzerine oynayan Rabbit, Duck ve Deer olarak tanımlanmış 3 versiyonlu bir opsiyon alım-satım stratejisi olup, " The Volatility Hunter" olarak adlandırılmıştır. Versiyonlar, farklı risk alma profillerine göre geliştirilmiş olup kayıp ve kar oranları Rabbit'ten Deer'a doğru artmaktadır.

Global finansal piyasalarda yaşanan son iki kriz (Mayıs 2006 & Ağustos 2007) piyasa dengesi için gelişmiş finansal araçların gerekliliğini bir kez daha göstermiştir. İstikrarlı bir ekonominin ve finans piyasasının oluşabilmesi için, daha gelişmiş ve uluslararası alanda kullanılan finansal araçların en kısa zamanda piyasalarımızda yerlerini alması ve devletin, finans piyasasının uluslararası bir oyuncu olacak şekilde gelişebilmesi ve kuvvetlenmesini sağlayacak desteği vermesi gerekmektedir. Ve akademisyenlerin de uluslararası piyasalarda kullanılan finansal araçlarını Türkiye'de kullanımı ile ilgili çalışmalarda bulunarak bu sürece destek vermeleri gerekir.

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ATM	: At the money
CBOT	: Chicago Board Of Trade
EUR	: European Union Currency
Fo	: Futures price
FOB	: Freight on Board
ISE	: Istanbul Stock Exchange
ITM	: In the money
OTC	: Over the counter
OTM	: Out of the money
St	: Spot price
TRY	: New Turkish Lira
TURKDEX	: Turkish Derivatives Exchange
US	: United States
USD	: United States Dollar

INTRODUCTION

Options and options market has witnessed an explosion of new development in the past 20 years. Examples for stock option valuations include Black and Scholes (1973), Merton (1976), Cox and Ross (1976), Hull and White (1987), Bailey and Stulz (1989) and Naik and Lee (1990). Examples for currency option models include Biger and Hull (1983), Garman and Kohlhagen (1983), Grabbe (1983), Chesney and Scott (1989), Amin and Jarrow (1991), Heston (1993), Bates (1996) and, Bakshi and Chen (1997). Moreover, many studies related with different options strategies have been done. Despite all these studies, still options are not fully understood and commonly used like the other financial tools.

This paper suggests an alternative options strategy for Turkish financial markets that have the requirement of holding multi – options. Moreover, the aim of this research is to attract the people for the opportunities in complicated financial tools. On the other hand, to point the obvious need of options in Turkey as one of the complicated financial tools used in the international developed economies that this country has lived many crises and fluctuations due to fragile economy.

The article is organized as follows. In Section 1 the forwards and futures were discussed shortly as the types of Derivatives and the differences were given compared to options. In Section 2 options was presented in detailed with the support of the Black–Scholes (BS) options pricing model and volatility; in Section 3, research design and methodology was formulated and the application of alternative options strategies were supported by back testing results. The strategies are tested in Turkish financial markets. The conclusion of the paper is presented in Section 4.

1. DERIVATIVES

A derivative can be defined as a financial instrument whose value depends on (or derives from) the values of other, more basic underlying variables.[1] Derivatives can be classified as forwards, futures, options and swaps. Financial derivatives, including currency, interest rate, and commodity derivatives, are one means of managing risks.[2] There are many differences between forward contracts and futures contracts. Among these differences are taxes, transactions costs, and the treatment of margin. Furthermore, in some instances, futures contracts are more liquid and easier to trade then are forward contracts.[3] In this paper, only forward and futures will be reviewed and options will be analyzed in depth.

1.1. Forward Contracts

Forward contract is a relatively simple derivative. "A forward contract is an agreement to buy or sell an asset at a certain time in the future for a certain price (the delivery price).[4] It can be contrasted with a spot contract, which is an agreement to buy or sell immediately. It is similar to a futures contract, except that it is traded in the over – the - counter market. Forward contracts are particularly popular on currencies and interest rates. A forward contract is traded in the over – the - counter market usually between two financial institutions or between a financial institution and one of its clients. One of the parties to a forward contract assumes a long position and agrees to buy the underlying asset on a certain specified future date for a certain specified price. The other party assumes a short position and agrees to sell the asset on the same date for

[1] John C. Hull, Options, Futures, and Other Derivatives, Fifth Edition, 2002

[2] W. Guay and S.P. Kothari, "How much do firms hedge with derivatives? / Journal of Financial Economics," 70, 2003, 423 – 461

[3] M.W. Simpson, "Selectively hedging the US dollar with foreign exchange futures contracts," Int. Fin. Markets, Inst. and Money, 14, 2004, 75 – 86

[4] Prof. Dr. Örten Remzi - Örten İpek, Türev Finansal Araçlar ve Muhasebe Uygulamaları, Gazi Yayınları, Ankara 2001

the same price."[5] The forward price for a contract is the delivery price that would be applicable to the contract if it were negotiated today (i.e., it is the delivery price that would make the contract worth exactly zero). The forward price may be different for contracts of different maturities.

As to give an example for analyzing the mechanics of the forwards,

On January 5, 2005 the treasurer of a corporation enters into a long forward contract to buy £1 million in six months at an exchange rate of 1.6100. This obligates the corporation to pay $1,610,000 for £1 million on June 5, 2005. Possible outcomes at the end of six months, if

a) Exchange rate rises to 1.7000…??? Or

b) Exchange rate falls to 1.5000…???

Assuming that at the end of the 6 months, the spot exchange rate rises to 1.7000, the forward contract would be worth $90.000 to the corporation, as the contract enables the corporation to purchase the Sterling at 1.6100 rather than at 1.7000. On the other hand, if at the end of the 6 months, the spot exchange rate falls to 1.500, and then the forward contract would be worth negative $110.000 to the corporation.

"In general, the pay - off from a long position in a forward contract on one unit of an asset is St - K, where K is the delivery price and St is the spot price of the asset at maturity of the contract. This is because the holder of the contract is obligated to buy an asset worth St for K. Similarly; the pay - off from a short position in a forward contract on one unit of an asset is K - St. These payoffs can be positive or negative and illustrated below in Figure 1. Because it costs nothing to enter into a forward contract, the pay - off from the contract is also the trader's total gain or loss from contract."[6]

[5] Hull, sixth Edition, 2003

[6] Hull, sixth Edition, 2003

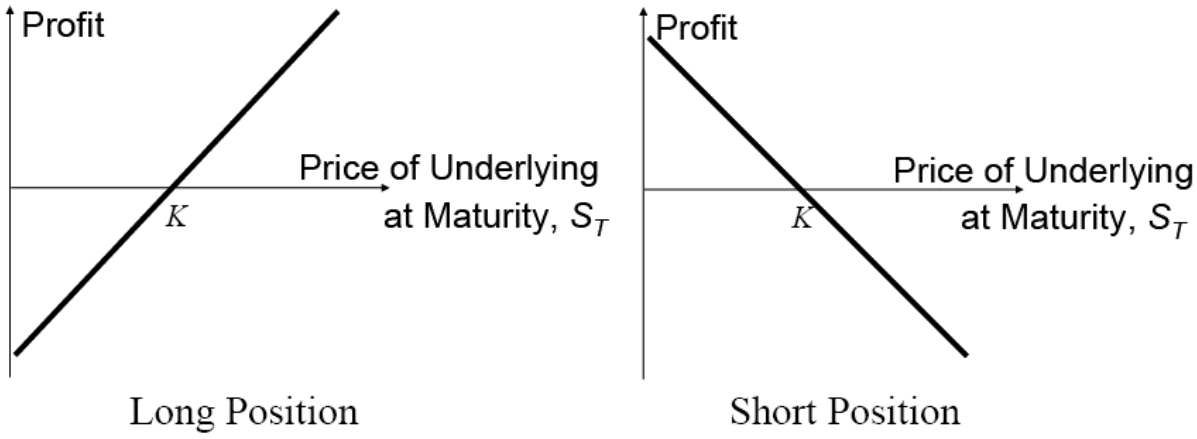

Figure 1: Pay - offs from Forward Contracts

Source: John C. Hull, Options, Futures, and Other Derivatives, sixth Edition, 2003

Forward contracts are utilized in Turkish Banking sector and below examples from one of Foreign Banks operating in Turkish market, presented for both importers and exporters.*

1) An importer that has USD (United States Dollar) payables to foreign companies and TRY (New Turkish Lira) receievables from local companies can lose its profit when USD/TRY parity goes up sharply. Neverthless, a forward parallel to company cash flow; buys USD and sells TRY can fix the USD/TRY parity that secures from eroding of operational profit.

- Spot USD/TRY parity :1.4660
- 3 months forward USD/TRY parity :1.5170
- FOB payables :10.000.000 USD
- Local receievables :15.170.000 TRY

* The author collects the general idea of this section from Fortis Bank product booklet by using own figures.

Table 1

Spot exchange rate at the maturity date	No Forward is bought (A)	Forward is bought (B)	Exchange rate Effect (B-A)
	The amounts of TRY for buying USD		
1.6600	16.600.000	15.170.000	-1,430,000 TRY
1.5500	15.500.000	15.170.000	-330,000 TRY
1.5170	15.170.000	15.170.000	0
1.5100	15.100.000	15.170.000	+70,000 TRY
1.4790	14.790.000	15.170.000	+380,000 TRY

2) Depending on company's trading direction, a vice-versa forward strategy can be needed. An exporter that has USD receievables from foreign companies and TRY payables to local companies can lose its profit when USD/TRY parity goes down sharply. Neverthless, a forward parallel to company cash flow, buys TRY and sells USD can fix the USD/TRY parity that secures from eroding of operational profit.

- Spot USD/TRY parity :1.4660
- 3 months forward USD/TRY parity :1.5110
- FOB receivables :10.000.000 USD
- Local payables :15.110.000 TRY

Table 2

Spot exchange rate at the maturity date	No Forward is bought (A)	Forward is bought (B)	Exchange rate Effect (B-A)
	The amounts of USD for buying TRY		
1.4100	14.100.000	15.110.000	-1,010,000 TRY
1.4800	14.800.000	15.110.000	-310,000 TRY
1.5110	15.110.000	15.110.000	0
1.5500	15.500.000	15.110.000	+390,000 TRY
1.6000	16.000.000	15.110.000	+890.000 TRY

3) Depending on company's operational currency, these two basic forward strategies can be modified. The company can be both an importer and an exporter that has EUR (European Union Currency) payables to foreign companies and USD receievables from foreign companies can lose its profit when USD/TRY parity goes up sharply. Neverthless, a forward parallel to company cash flow, buys EUR and sells USD can fix the EUR/USD parity that secures from eroding of operational profit.

- Spot EUR/USD parity :1.2925
- 3 months forward EUR/USD parity :1.2990
- FOB payables :10.000.000 €
- FOB receivables :12.990.000 $

Table 3

Spot exchange rate at the maturity date	No Forward is bought (A)	Forward is bought (B)	Exchange rate Effect (B-A)
	The amounts of USD for buying EUR		
1.3385	13.385.000	12.990.000	-395,000 $
1.3150	13.150.000	12.990.000	-160,000 $
1.2990	12.990.000	12.990.000	0
1.2850	12.850.000	12.990.000	+140.000 $
1.7550	12.755.000	12.990.000	+235,000 $

1.2. Future Contracts

Future Contract is an agreement to buy or sell an asset for a certain price at a certain time. It is a standardized, transferable, exchange-traded contract that requires delivery of a commodity, bond, currency, or stock index, at a specified price, on a specified future date.[7] Futures are similar to forwards but feature formalized and standardized characteristics.

Key differences in futures (as opposed to forwards) are as following,

- Traded on an exchange
- Secondary market -liquidity
- Marked to market
- Standardized contract units
- Settled daily

[7] http://www.investorwords.com/2136/futures_contract.html (20th June 2007)

On the other hand, when Options and Futures/Forwards are compared, it is observed that

- An option gives the holder the right to buy or sell at a certain price
- A futures/forward contract gives the holder the obligation to buy or sell at a certain price

Futures price is an agreed - upon price (similar to strike price in option markets). Long position – is agree to buy and Short position – is agree to sell can be interpreted, as "Long position takers expect that the asset will rise in value [8] while Short position takers expect that the asset will fall in value". [9] Profits on positions at maturity are zero-sum game.

- For the Long position takers it is: **St** (Spot price) **– Fo** (Futures price)
- For the Short position takers it is: **Fo** (Futures price) **– St** (Spot price)

The underlying asset that the seller delivers to the buyer at the end of the contract may exist (interest rate) or may not exist (bond). For example, the underlying asset of the CBOT (Chicago Board Of Trade) 30-Year US (United States) Treasury bond future is a fictive 30-year maturity US Treasury bond with 6% coupon rate. The contract size specifies the notional principal or principal value of the asset that has to be delivered. For instance, the notional principal of the CBOT 30-Year US Treasury bond future is $100,000.

The futures price is quoted differently depending on the nature of the underlying asset. When the underlying asset is an interest rate, the future price is quoted to the second decimal point as 100 minus this interest rate. When the underlying asset is a bond, it is quoted in the same way as a bond, i.e., as a percentage of the nominal value of the underlying. The tick is the minimum price fluctuation that can occur in trading.

[8] http://www.investopedia.com/terms/l/long.asp (20th June 2007)

[9] http://www.investopedia.com/terms/l/long.asp (20th June 2007)

Sometimes daily price movement limits as well as position limits are specified by the exchange.

Clearinghouse acts as a party to all buyers and sellers. It is obligated to deliver or supply delivery. Initial margin are funds deposited to provide capital to absorb losses. Each day profits or losses from new prices are reflected in the margin account. Maintenance or variation margin is an established margin below, which a trader's margin may not fall. When the maintenance margin is reached, broker will ask for additional margin funds.

A margin is cash or marketable securities deposited by an investor with his or her broker. The balance in the margin account is adjusted to reflect daily settlement. Margins minimize the possibility of a loss through a default on a contract.

1.2.1. TURKDEX (Turkish Derivatives Exchange) (VOB – Vadeli İşlem ve Opsiyon Borsası)

In Turkey, Futures are traded in TURKDEX, which has the center in Izmir. TURKDEX has started to operate in 6th February 2005 and reached 69 members 16 of which are Banks and 53 are Brokerage Houses, as of June 2007.[10]

TURKDEX has founded by 11 institutions as follows,

[10] http://www.turkdex.org.tr/VOBPortalEng/DesktopDefault.aspx?tabid=295 (22nd June 2007)

Table 4

TURKDEX Share - holders

Shareholder	Percentage
The Union of Chambers and Commodity Exchanges of Turkey	25%
Istanbul Stock Exchange	18%
Izmir Mercantile Exchange	17%
Yapi ve Kredi Bankasi	6%
Akbank	6%
Vakif Investment Securities	6%
Garanti Bankasi	6%
Is Investment Securities	6%
The Association of Capital Market Intermediary Institutions of Turkey	6%
ISE (Istanbul Stock Exchange) Settlement and Custody Bank	3%
Industrial Development Bank of Turkey	1%

Source: http://www.turkdex.org.tr (25th 2007)

The contract volume, in 1st year, has reached to 3.7 billion TRY that comes from mainly 59% currency, 31% ISE future contracts and 10% others. As of end – 2006 the annual contract volume increased sharply to 18 billion TRY that shows TURKDEX has become an essential institute for Turkish financial markets.[11]

The portfolio of contract volume (59% currency contracts) also gives the clues about what the Turkish market exactly needs and which variable in the market; people want to take the control of.

To review the TURKDEX, there are mainly 4 future contracts types, which are currency, ISE index, interest rates and commodity.

[11] http://www.turkdex.org.tr/VOBPortalEng/DesktopDefault.aspx?tabid=295 (22nd June 2007)

1.2.2. Currency Futures Contracts

Exchange rate risk is a very important issue for many people. Individuals, firms or financial institutions may use the TRY-USD and TRY-EUR futures contract to hedge them against the exchange rate volatility. Exchange rate movements can affect firm value through translation, transaction and competitive effects.[12] TRY-USD and TRY-EUR contracts might also be used for investment purposes other than hedging. The difference between the futures exchange rate and current spot exchange rate is defined as the basis of the futures contract.[13]

Despite the widespread advocacy of using currency options in foreign exchange risk management, the question concerning their proper application as a hedging instrument remains largely unexplored. The purpose of this paper is to examine the hedging role of currency options under the premise that international firms face not only hedge able exchange rate risk but also other sources of non-hedge able risk. For example, automobile manufacturers must plan production in advance and face high costs of holding inventory. Although there are formal wholesale prices in effect at any time, dealers often pay somewhat less. Prices are in essence determined by market conditions as the automobile manufacturers need constantly adjust their prices to match sales and production.[14] In this sense, there is price risk, which is not hedge able. Another example would be producers of commodity chips whose prices are highly fluctuating and cannot be hedged.[15]

It has recently shown that commonly used strategies to hedge against currency risk, such as one-period cash flow hedges and long-term fixed hedges, may leave the

[12] S.D. Makar and S.P. Huffman, "Foreign exchange derivatives, exchange rate changes, and the value of the firm: U.S. multinationals' use of short-term financial instruments to manage currency risk," Journal of Economics and Business, 53, 2001, 421 – 437

[13] A.C. Inci, B. Lu, "Currency futures-spot basis and risk premium," International Financial Markets, Institution and Money, 17, 2007, 180 – 197

[14] Friedman, J.W., "Oligopoly Theory," Cambridge University Press, Cambridge, 1983

[15] K.P. Wong, "Currency hedging with options and futures," European Economic Review, 47, 2003, 833 – 839

firm exposed to foreign exchange risk.[16] It is a new and alternative investment product, which offers new opportunities for investors with its leverage effect.

1.2.2.1. "TURKDEX - TRY US Dollar" Futures

Contract Specifications

Underlying Asset : TRY/US Dollar Parity

Contract Size : 1.000 US Dollar

Price Quotation : New Turkish Lira per US Dollar with four digits. Sample quote = 1,4155 TRY or 1,4160 TRY

Daily Price Limit : % $\pm$10 above or below the prior day's settlement price

Minimum Price Fluctuation (Tick): 0,0005 = 0,5 TRY

Contract Months : February, April, June, August, October and December (Contracts with three different expiration months nearest to the current month shall be traded concurrently. If December is not one of those three months, an extra contract with an expiration month of December shall be launched.)

Final Settlement Day : Last business day of the contract month

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : US Dollar selling rate announced by the Central Bank of the Republic of Turkey at 3:30 PM of the last trading day

[16] Brealey, R., and Kaplanis, E., "Discrete exchange rate hedging strategies," Journal of Banking and Finance, 19, 1995, 765 - 784.

Daily Settlement Price : Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't reflect the market very well, then daily settlement price is calculated through the methods as mentioned below:

- Weighted average of all prices during the day,

- Prior day's settlement price,

- Mean of the best bid and ask quotations,

Theoretical future price calculated by the Settlement Price Committee.

1.2.2.2. "TURKDEX - TRY Euro" Futures

Contract Specifications

Underlying Asset : TRY/Euro Parity

Contract Size : 1.000 Euro

Price Quotation : New Turkish Lira per Euro with four digits. Sample quote = 1,8865 TRY or 1,8870 TRY

Daily Price Limit : % $\pm$10 above or below the prior day's settlement price

Minimum Price Fluctuation (Tick) : 0,0005 = 0,5 TRY

Contract Months : February, April, June, August, October and December (Contracts with three different expiration months nearest to the current month shall be traded concurrently. If December is not one of those three months, an extra contract with an expiration month of December shall be launched.)

Final Settlement Day : Last business day of the contract month

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : Euro selling rate announced by the Central Bank of the Republic of Turkey at 3:30 PM of the last trading day

Daily Settlement Price : Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

- If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't reflect the market very well, then daily settlement price is calculated through the methods as mentioned below:

  - Weighted average of all prices during the day,

  - Prior day's settlement price,

  - Mean of the best bid and ask quotations,

  Theoretical future price calculated by the Settlement Price Committee.

1.2.3. Equity Index Futures Contracts

People prefer to invest savings in financial tools, which give the highest return. T-bills and equities are the first classical investment tools that one might think of. With the introduction of the ISE-30 and ISE-100 Index Future contracts, investors will have the chance to invest on the direction of the whole economy. If it is thought that there will be good progress at the pace of the economy, the index is bought; otherwise investors will short the index.

1.2.3.1. "TURKDEX – ISE 100" Futures

Contract Specifications

Underlying Asset : Value calculated based on the stock prices of the companies included in ISE National-100 stock price index by using the index's calculation method

Contract Size : Value calculated by dividing the index value by 1.000 and multiplying the quotient by TRY 100

(ISE National-100 Index/1.000)*TRY100

(Example: 37,825*100=TRY 3.782,5)

Price Quotation : ISE National-100 Index value, divided by 1.000 shall be quoted significant to three decimals

Daily Price Limit : ±%10 of the established Base Price for each contract with a different contract month

Minimum Price Fluctuation (Tick) : 0,025 (25 ISE National-100 Index points) Value of one tick corresponds to TRY 2,5

Contract Months : February, April, June, October and December (Contracts with three different expiration months nearest to the current month shall be traded concurrently)

Final Settlement Day : Last business day of each contract month

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : Arithmetic average of 10 randomly selected, less than 30 seconds apart, ISE National-100 Index values executed at the ISE within the last 15 minutes before the closing of the trading session of the Exchange on the last trading day shall be used as the last settlement price of the futures contract. If the ISE trading session closes before that of the Exchange, calculation method being the same, calculations shall be made based on the ISE National-100 Index values executed during the last 15 minutes before the closing of the ISE trading session

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

- Weighted average price of all the transactions performed within the last 10 minutes before the closing of the trading session based on the quantity thereof shall be established as the daily settlement price.

- If number of transactions performed within the last 10 minutes before the closing of the trading session is less than 10, weighted average of the last 10 transactions before the closing shall be calculated instead.

- If the daily settlement price cannot be calculated using the above-explained methods, daily settlement price may be determined by using below explained methods separately or in combination.weighted average price of all the transactions performed throughout the trading session,

- Previous day's settlement price,

- Average of the best bid and best ask quotations at the closing of the trading session,

- Theoretical futures prices to be calculated using the interest rate to be determined by the Exchange for the time period until the expiration date of the contract, spot price of the underlying asset or daily settlement price valid for other contracts with different contract months.

1.2.3.2. "TURKDEX - ISE 30" Futures

Contract Specifications

Underlying Asset : Value calculated based on the stock prices of the companies included in ISE National-30 stock price index by using the index's calculation method

Contract Size : Value calculated by dividing the index value by 1.000 and multiplying the quotient by TRY 100

(ISE National-30 Index/1.000)*TRY 100

(Example: 47,325*100=TRY 4.732,5)

Price Quotation : ISE National-30 Index value, divided by 1.000 shall be quoted significant to three decimals

Daily Price Limit : ±%10 of the established Base Price for each contract with a different contract month

Minimum Price Fluctuation (Tick) : 0,025 (25 ISE National-30 Index points) Value of one tick corresponds to TRY 2,5

Contract Months : February, April, June, October and December (Contracts with three different expiration months nearest to the current month shall be traded concurrently)

Final Settlement Day : Last business day of each contract month

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : Arithmetic average of 10 randomly selected, less than 30 seconds apart, ISE National-30 Index values executed at the ISE within the last 15 minutes before the closing of the trading session of the Exchange on the last trading day shall be used as the last settlement price of the futures contract. If the ISE trading session closes before that of the Exchange, calculation method being the same, calculations shall be made based on the ISE National-30 Index values executed during the last 15 minutes before the closing of the ISE trading session

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

- Weighted average price of all the transactions performed within the last 10 minutes before the closing of the trading session based on the quantity thereof shall be established as the daily settlement price.

- If number of transactions performed within the last 10 minutes before the closing of the trading session is less than 10, weighted average of the last 10 transactions before the closing shall be calculated instead.

- If the daily settlement price cannot be calculated using the above-explained methods, daily settlement price may be determined by using below explained methods separately or in combination.

- Weighted average price of all the transactions performed throughout the trading session,

- Previous day's settlement price,

- Average of the best bid and best asked quotations at the closing of the trading session,

- Theoretical futures prices to be calculated using the interest rate to be determined by the Exchange for the time period until the expiration date of the contract, spot price of the underlying asset or daily settlement price valid for other contracts with different contract months.

1.2.4. Interest Rate Futures Contracts

The fluctuations in interest rates have serious effects on people. Research on the relative pricing of short-term interest rate futures and forward contracts has not been definitive, primarily due to the absence of data from the over-the-counter (OTC) market that trade forward rate agreements (FRAs).[17]

A bond portfolio that a fund manager is managing, a mortgage that one just made to buy a house, a bank credit that one received to buy a new car are all good examples of how people are exposed to interest rate risk during their daily life. Individuals and firms might hedge themselves against the short-term interest rate risk by using the 91-Day T-Bill, 365-Day T-Bill and T-Benchmark futures contract at TURKDEX.

1.2.4.1. "TURKDEX - 91 Day T-Bill" Futures

Contract Specifications

Underlying Asset : 91-Day Turkish Treasury Bills having a face value at maturity of 100 TRY

[17] R. Poskitt, "Interest rate futures and forwards: Evidence from the sterling futures and FRA markets" Int. Fin. Markets, Inst. and Money, 2007, 2 – 14

Contract Size : 10.000 TRY (100 T-Bills each having a face value of 100 TRY) (Contract size = 94,475*100 = 9.447,5 TRY)

Price Quotation : Quoted by per 100 TRY face value (94,546 TRY or 94,547 TRY)

Daily Price Limit : % ±2 above or below the prior day's settlement price

Minimum Price Fluctuation (Tick) : 0,001 = 0,1 TRY

Contract Months : 3 nearest months out of February, April, June, August, October and December (like February, April, June or April, June, August)

Final Settlement Day : The next business day after the auction of the 91-Day reference T-bill. If there isn't any auction on the contract month, the settlement will be made on the third Tuesday of the contract month.

Last Trading Day : If there is a 91-Day reference T-Bill auction of the Treasury on the contract month, the last trading day is the Monday of the auction week. And the trading ceases at 12:00 noon on that day. If there is no auction on that month, the last trading day is the third Monday of the contract month.

Settlement Method : Cash Settlement

Final Settlement Price : The value of 91-day reference T-Bills issued by the Turkish Treasury on the last or the day after the last trading day of the contract month. If there is no issue on these days then the last settlement price is calculated by using the Istanbul Stock Exchange 91 day T-bill Index declared on the last trading day.

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't reflect the market very well, daily settlement price is calculated through the methods as mentioned below:

- Weighted average of all prices during the day,
- Prior day's settlement price,
- Mean of the best bid and ask quotations,
- Theoric future price calculated by the Settlement Price Committee.

1.2.4.2. "TURKDEX - 365 Day T-Bill" Futures

Contract Specifications

Underlying Asset : 365 day Turkish Treasury Bills having a face value at maturity of 100 TRY

Contract Size : 10.000 TRY (100 T-Bills each having a face value of 100 TRY) (Contract size = 80,665*100 = 8.066,5 TRY)

Price Quotation : Quoted by per 100 TRY face value (80,670 TRY or 80,675 TRY)

Daily Price Limit : % $\pm$5 above or below the prior day's settlement price

Minimum Price Fluctuation (Tick): 0,005 = 0,5 TRY

Contract Months : 3 nearest months out of February, April, June, August, October and December (like February, April, June or April, June, August)

Final Settlement Day : The third Tuesday of the contract month

Last Trading Day : The third Monday of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : The last settlement price is calculated by using the Istanbul Stock Exchange 365 day T-Bill Index declared on the last trading day.

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

- If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't reflect the market very well, daily settlement price is calculated through the methods as mentioned below:

  - Weighted average of all prices during the day,

  - Prior day's settlement price,

  - Mean of the best bid and ask quotations,

  - Theoric future price calculated by the Settlement Price Committee.

1.2.5. Commodity Futures Contracts

Commodity prices and the general price level tend to be closely related, with movements in the former leading movements in the latter. At least two reasons can be proffered to explain this relationship. First, primary goods are inputs for manufactured goods; hence changes in commodity prices directly influence production costs and the general price level. Second, most commodity prices are determined in auction markets, hence they reflect demand or supply shocks more rapidly than do the prices of manufactured goods. For these reasons, commodity price changes resulting from speculative purchases or sales of commodities can be leading indicators of general price level changes.[18]

Now with the introduction of the cotton, wheat and gold futures contract; farmers, jewelers, traders or merchants have the chance to hedge this risk effectively and be able to make long-term plans. Other than hedging, cotton, wheat and gold futures contract also offers investment opportunities for people who are looking for new and alternative investment tools.

1.2.5.1. "TURKDEX - Gold" Futures

Contract Specifications

Underlying Asset : 995/1000 fineness refined gold

Contract Size : 100 grams

Price Quotation : New Turkish Lira per gram with three digits. Sample quote = 22,680 TRY or 22,685 TRY

Daily Price Limit : % $\pm$10 above or below the prior day's settlement price

[18] R. Bhar and S. Hamori, "Information content of commodity futures prices for monetary policy," Economic Modeling, 2007, 2 – 10

Minimum Price Fluctuation (Tick): 0,005 = 0,5 TRY

Contract Months : 3 nearest months out of February, April, June, August, October and December (like February, April, June or April, June, August)

Final Settlement Day : Next business day after the last trading day

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : The price which is announced in the second gold fixing session in London is multiplied by US Dollar selling rate announced by the Central Bank of the Republic of Turkey at 3:30 pm on the last trading day. If there is no gold fixing price then the last settlement price is calculated by using international gold spot price on the last trading day, mid price of gold, at 5:00 pm (local time) on the last trading day (1 troy ounce =31,1035 grams).

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

- If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't reflect the market very well, daily settlement price is calculated through the methods as mentioned below:

- Weighted average of all prices during the day,

- Prior day's settlement price,

- Mean of the best bid and ask quotations,
- Theoric future price calculated by the Settlement Price Committee.

1.2.5.2. "TURKDEX - Aegean cotton" Futures

Contract Specifications

Underlying Asset : Aegean Standard 1 Cotton

Contract Size : 1 tone

Price Quotation : New Turkish Lira (TRY) per kg with three digits. Sample quote = 1,825 or 1,830

Daily Price Limit : % $\pm$10 above or below the prior day's settlement price

Minimum Price Fluctuation (Tick) : 0,005 = 5 TRY

Contract Months : 5 nearest months out of March, May, July, October and December

Final Settlement Day : Last business day of the contract month

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : Weighted arithmetic mean of Aegean Standard 1 cotton prices announced by Izmir Mercantile Exchange at the last trading day of the contract month and minimum two business days prior to the last trading day.

If there are insufficient trades during these days, price quotations are taken from minimum twelve members of Izmir Mercantile Exchange (Price interval must be lower than %1). After eliminating the best and the worst prices, the arithmetic mean of the available prices at the Izmir Mercantile Exchange is declared as the last settlement

price. Settlement Price Committee decides whether trades at spot market is sufficient or not.

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

- If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't reflect the market very well, daily settlement price is calculated through the methods as mentioned below:

- Weighted average of all prices during the day,

- Prior day's settlement price,

- Mean of the best bid and ask quotations,

- Theoric future price calculated by the Settlement Price Committee.

1.2.5.3. "TURKDEX - Anatolian Red Wheat" Futures

Contract Specifications

Underlying Asset : Anatolian Red Hard Wheat

Contract Size : 5 tones

Price Quotations : New Turkish Lira (TRY) per kg with four digits. Sample quote = 0,3865 or 0,3870

Daily Price Limit : % ±10 above or below the prior day's settlement price

Minimum Price Fluctuation (Tick) : 0,0005 = 2,5 TRY

Contract Months : 5 nearest months out of March, May, July, October and December

Final Settlement Day : Last business day of the contract month

Last Trading Day : Last business day of the contract month

Settlement Method : Cash Settlement

Final Settlement Price : Arithmetic mean of the prices belonging to Anatolian Red Hard Wheat announced by Polatli, Edirne, Eskisehir, Konya, Gaziantep, Karaman, Corum, Uzunkopru and Yozgat Mercantile Exchanges on the last trading day of the contract month and one business day before that day.

If there are no trades at the Exchanges mentioned above or if the Settlement Price Committee determines that the settlement price doesn't provide a definite picture of the market at the specified period, the last settlement price should be calculated and declared by the committee.

Daily Settlement Price : Daily settlement price is established at the closing of each trading session as follows:

Daily Settlement Price calculated as mentioned below:

- Weighted average of all prices during the last 10 minutes of trading at TURKDEX.

- If there are insufficient trades (less than 10) during the last 10 minutes of trading, weighted average of last 10 prices during the day.

- If daily settlement price can not be calculated through above methods or Settlement Price Committee determines that the settlement price doesn't provide a definite picture of the market, daily settlement price is calculated through the methods as mentioned below:

  - Weighted average of all prices during the day,
  - Prior day's settlement price,
  - Mean of the best bid and ask quotations,
  - Theoric future price calculated by the Settlement Price Committee.[19]

[19] http://www.turkdex.org.tr (25th 2007). The TURKDEX contracts specifications were reviewed from its web site.

2. OPTIONS

The buyer of a call option has the right to buy the underlying asset in the future at a specified (strike) price. The buyer of a put option has the right to sell the underlying asset in the future at the strike price. The buyer of the option pays a premium to the seller (usually upfront, but can be deferred, paid in installments, or via a swap). The seller (or 'writer') has the obligation to buy or sell the asset at the strike price if the holder exercises the option.[20]

The option contract is a right to buy or to sell another asset at a given price within a specified period of time. The life of an option contract is usually measured in months so that the price of the contract, called premium, is not affected by unexpected events that take place after the option expires. For every buyer of a put or a call there is seller.[21]

Call options give the buyer the right, but not the obligation, to buy the underlying at the stated strike price within a specific period. Put options give the buyer the right, but not the obligation, to sell the underlying at the stated strike price within a specific period.[22]

The strike is the price that a call option holder has the right to pay for buying the underlying asset and a put option holder has the right to receive for selling the underlying asset. The premium is equal to the intrinsic value of the option plus time value. The premium also represents the expected cost of hedging the option. The premium may be quoted as a cash amount or as a percentage of the spot value of the underlying asset.

[20] Client Product Book, Equity Structured Products, Deutsche Bank 2005

[21] Fischer Black and Myron Scholes, "The Valuation of Option Contracts and a Test of Market Efficiency," The Journal of Finance, Vol. 27, No. 2, New Orleans, (May, 1972), 399-417.

[22] Paul Brittain and Carley Garner, "The 3-D World of Options," Futures, Fall Special Issue 2006, 6 – 12

The figure below shows the payoff profile at expiry for buying a call option. The current share price is $ 100, the strike is $105 and the option value is $ 5 (simplified).

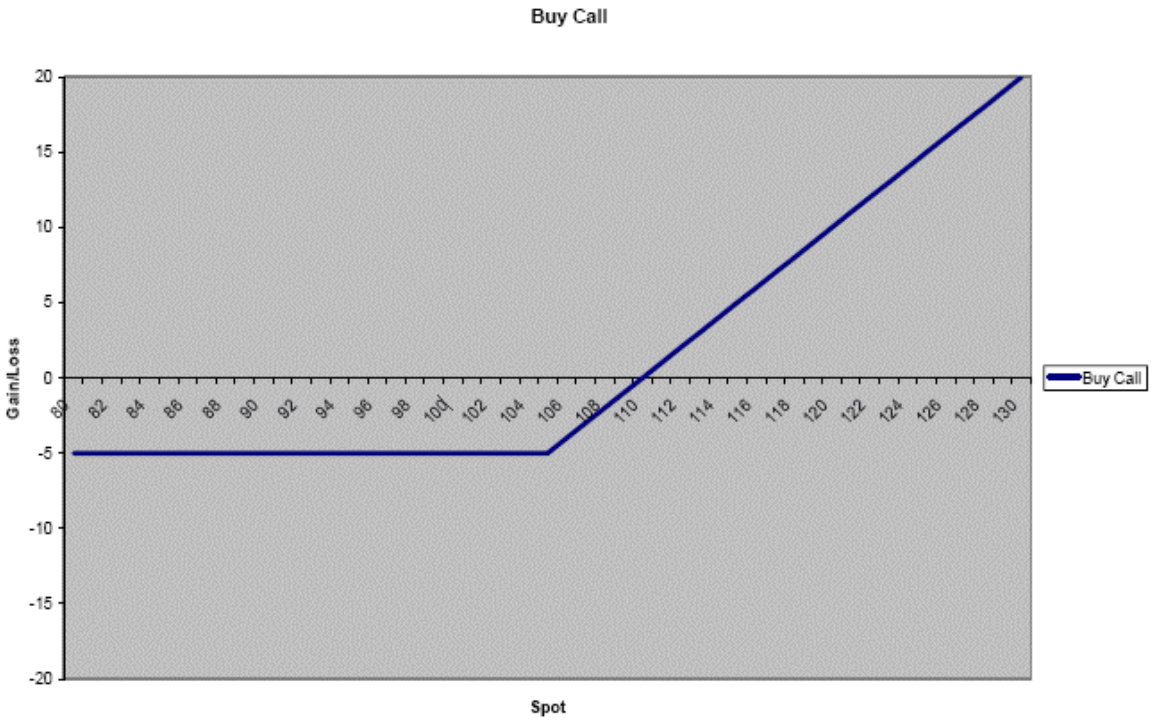

Figure 2: Buy Call Graph

For the buyer of the option, the maximum that can be lost is the premium of $ 5, in case that the option expires worthless. If the share price rises above the strike of $ 105, to say $ 120, the option is said to be in - the - money, because the buyer of the option can buy shares at $ 105 with the option and sell them in the market at $ 120. When taken the premium paid into account, the option buyer has made a profit of $ 120- $ 105 -$ 5 = $ 10. The breakeven is at $ 110, which is simply the option strike of $ 105 plus the premium of $ 5. In other words, the stock price has to rise above $ 110 for the option buyer starts to profit from the trade.

Options can have a variety of strikes. The lower the price at which the call is struck, the more expensive it will be. A call option is in – the - money (ITM) if the strike price is less than the market price of the underlying security. A put option is in – the - money if the strike price is greater than the market price of the underlying security.

A call option is out – of – the money (OTM) if the strike price is greater than the market price of the underlying security. A put option is out – of - the – money if the strike price is less than the market price of the underlying security, and if the strike price is the same as the market price of the underlying security, both are at - the - money (ATM).[23]

When there is an option buyer, there must be a seller as well. The payoff profile for selling a call is shown in the figure below. The profile for selling a call is just the opposite of buying a call, as the buyer and seller have equal and opposite positions. Selling a call is just the mirror image of buying a call. There is an equilibrium in which some investors buy call/put options on the market portfolio while others sell them.[24]

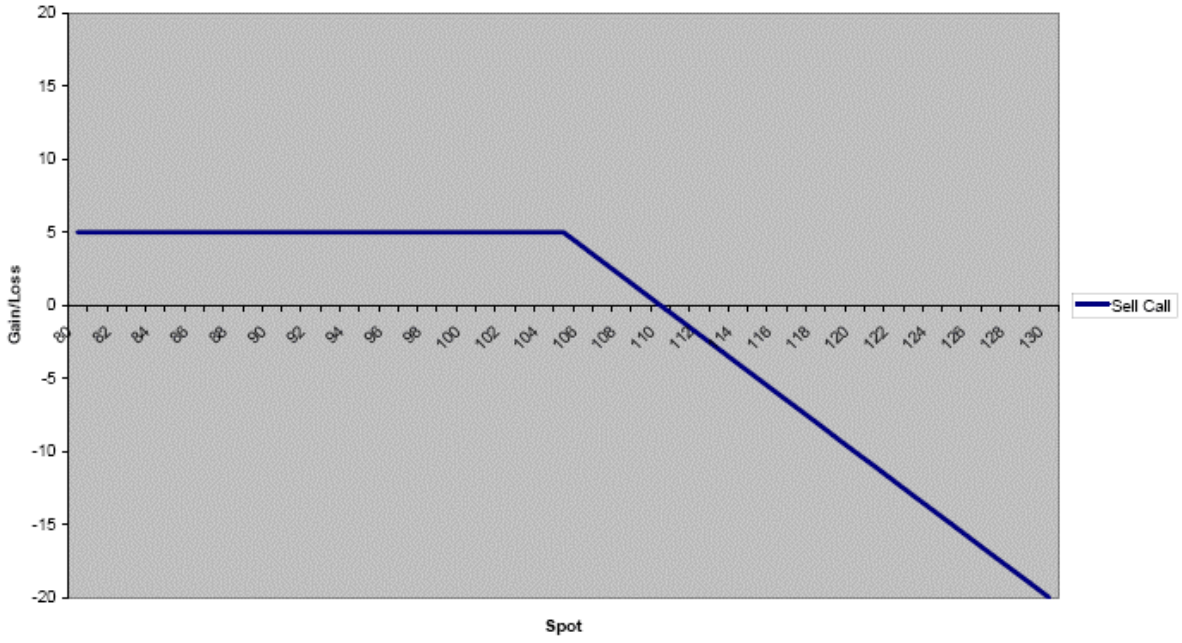

Figure 3: Sell Call Graph

[23] The options industry Council, Options strategies Quick Guide, New York, 2004

[24] G. Franke, R.C. Stapleton and M.G. Subrahmanyam, "Who Buys and Who Sells Options: The Role of Options in an Economy with Background Risk", Journal of economic theory, 82, 1998, 89 - 109

Note that the figures above show the option at expiry. The figure below shows the price of a 6-month call option at inception and expiry, strike at $ 105, current stock price at $ 100, volatility at 25.40%, and premium of $ 5.

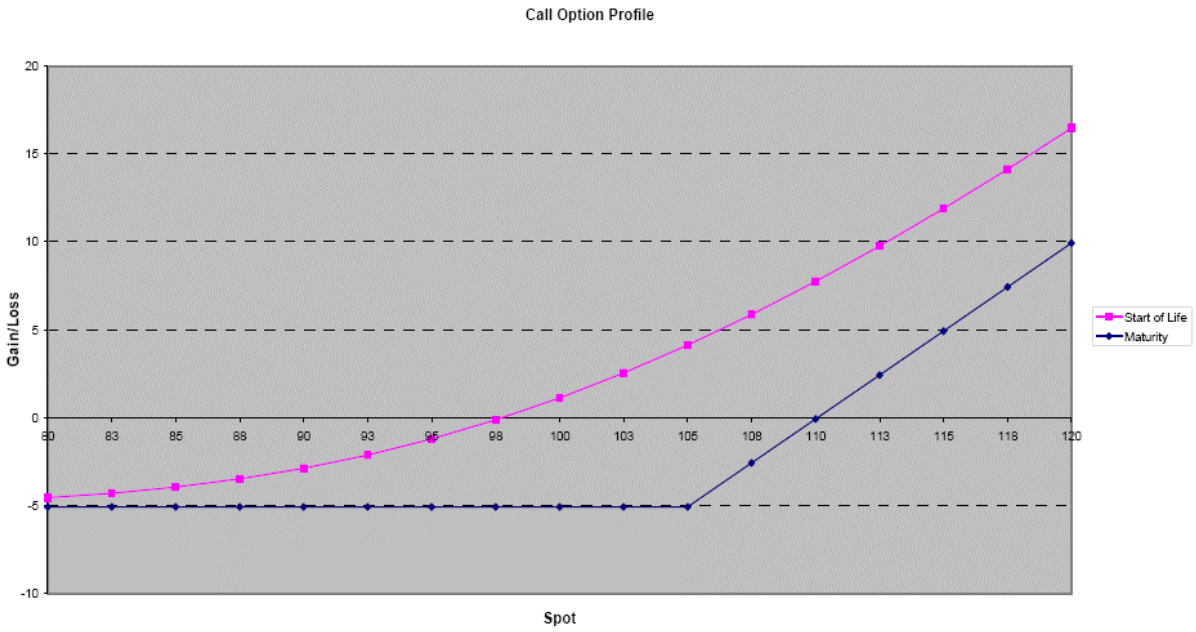

Figure 4: Call Option Profile Graph

If we fill in some intermediate dates, it is possible to see in detail the decay in the option value through time.

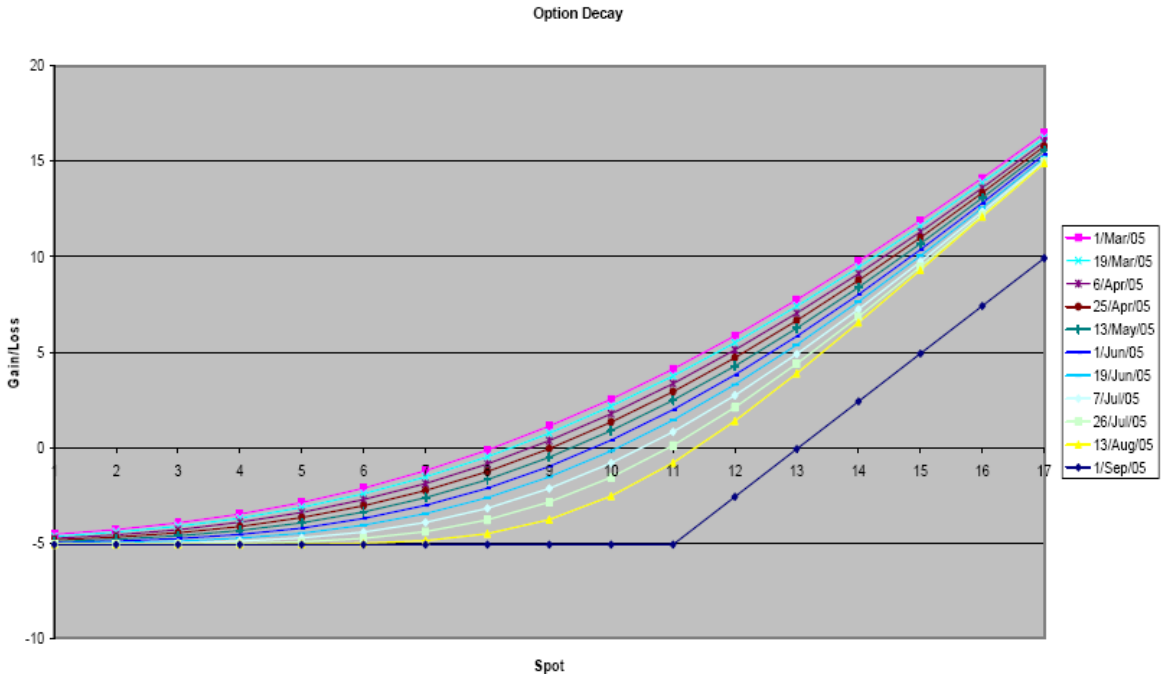

Figure 5: Option Decay Graph

The fact that option decays and does not have the same shape profile throughout its life, has implications for both trading and hedging.

The simplest way to use equity options is to buy calls to get long exposure to the market. An investor who buys outright calls is likely to be fairly bullish on the stock. In that case, not just buying the stock in relation with behaviour of investors is main question. The difference between buying the call and buying the stock is that the call has limited downside; the most that can be lost is the premium, whereas with the stock there is full upside and downside. The call therefore has a degree of insurance (the cost of which is the premium paid).

The figure below shows that, should the stock price fall below $ 95, the option would have been a better choice (at a stock price of $ 95 the option and stock choices are equal, as the stock has lost $ 5 and the option cost $ 5). The buyer of the call will still benefit as the stock price rises above $ 110(the breakeven), but not by as much as holding the stock. In fact, the option will under perform the stock return by $ 10, given the premium of $ 5 and strike of $ 105 versus the initial stock price of $ 100.

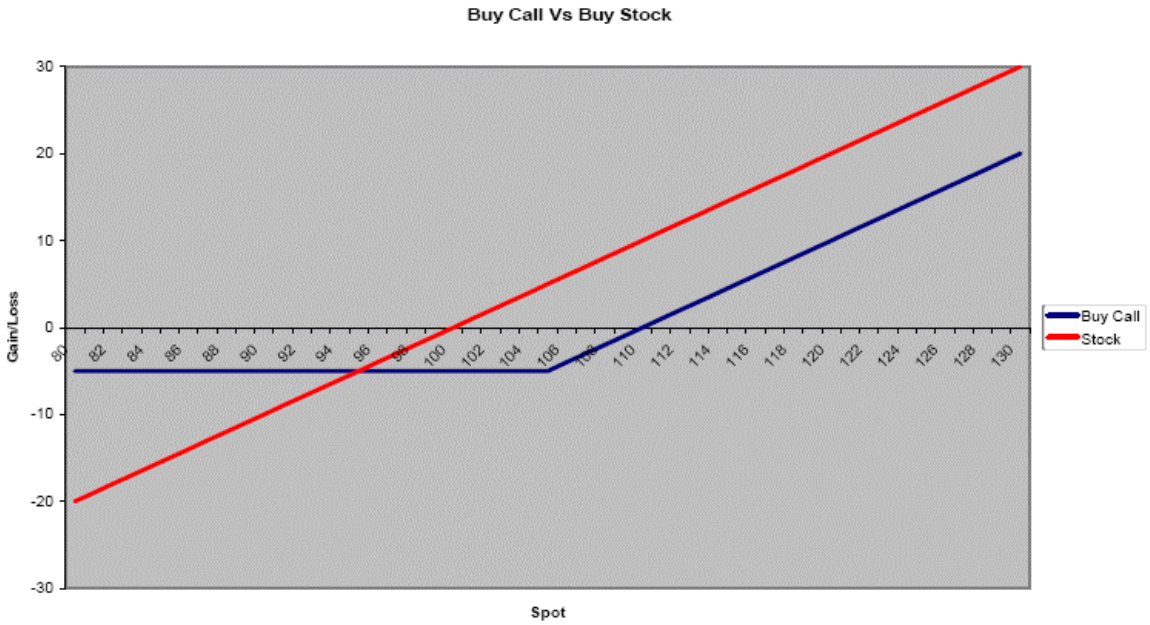

Figure 6: Buy Call vs. Buy Stock Graph

Once the calls are considered then puts are fairly straightforward to understand. Below are profits for buying and selling puts. The put option below has a strike of $ 95, premium of $ 5 and a current stock price of $ 100. Note the breakeven at $ 90, which is just the strike of $ 95 minus the premium of $ 5. Also, the maximum that can be lost if the share price rises is the premium paid of $ 5.

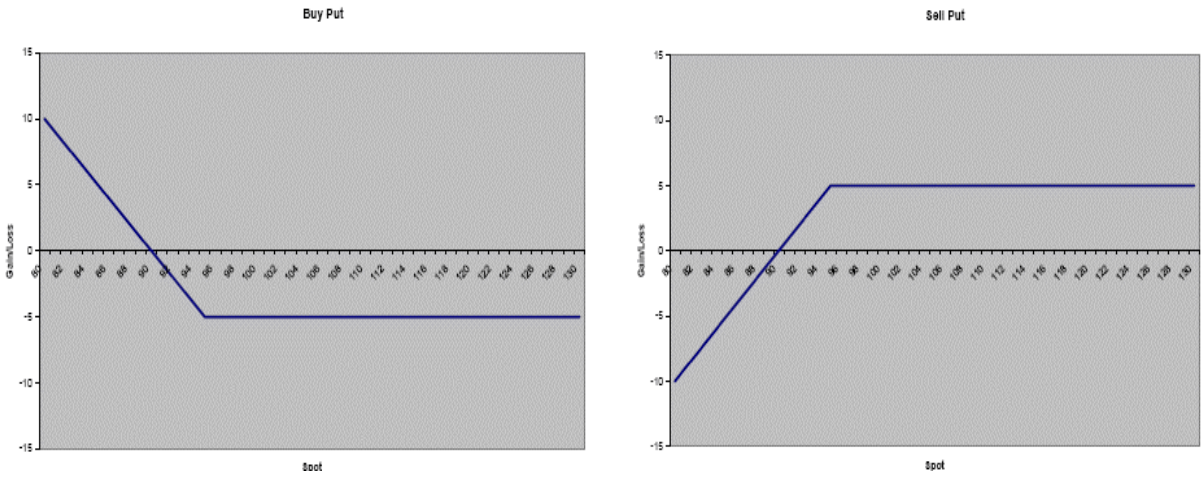

Figure 7: Buy Put & Sell Put Graphs

A European option can be exercised only at expiry. An American option can be exercised at any time before or at expiry. The main difference between OTC and exchange-traded options are the way in which the strike prices are referenced and the option premium is quoted. On exchanges, the strike price and premium are traditionally quoted in fixed currency terms while OTC options often have their strikes and premiums quoted in percentage terms.

OTC contracts can be tailored in any way the client wishes with respect to strike, notional, expiration, delivery or "exotic" characteristics, although non-standard listed "FLEX" options have become more common on certain exchanges. Exchange-traded options often require "margining" for example; deposit of cash/securities must be posted to the exchange/clearing house that is then adjusted for daily option price changes. [*]

2.1. Hedging with Options:

The statistics shows that the use of options as a hedging instrument has been examined much less than the use of futures.[25] However, there is an accelerating usage of options with increase in knowledge.

A simple hedge against a stock or portfolio of stocks would be to buy a put option on the individual stock or index. The figure below shows the separate profiles of buying a put and owning the stock (put strike $ 95, current stock price at $ 100, put premium paid $ 5). It shows that the losses on the stock position when the price falls are offset by gains on the put position. On the other hand, most of the upside of increases in the stock is kept because the gains on the stock are greater then the premium paid for the put.

[*] The author has taken the general idea of pages 32-34 from Bender Securities "Options" Booklet.

[25] 16 S.Z. Benninga and C.M. Oosterhof, "Hedging with forwards and puts in complete and incomplete markets," Journal of Banking & Finance, 28, 2004, 1 – 17

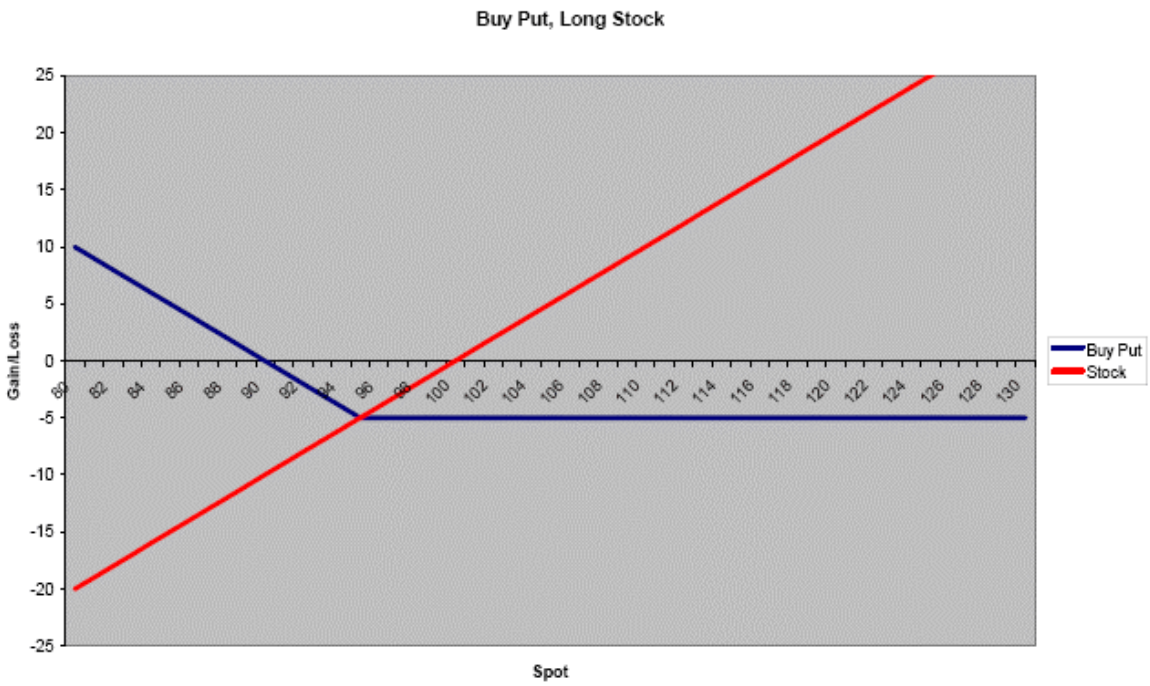

Figure 8: Buy Put, Long Stock Graph

The two separate profiles above can be combined to show the final profile for the hedger, as in the figure below. It shows that the worst lost scenario is $ 10, which would occur when the share price drops below the strike of $ 95 from the original price of $ 100. If the price falls to say, 80, then the stock position has lost $ 100- $80 = $ 20, but the put has gained $ 95- $ 80-$ 5 = $ 10, giving a combined loss of $ 10.

If a not hedged position is added to the figure above, the below figure is obtained, which shows that the worst of the stock price falls are curtailed by the hedge, whereas much of the upside is maintained (minus the premium).

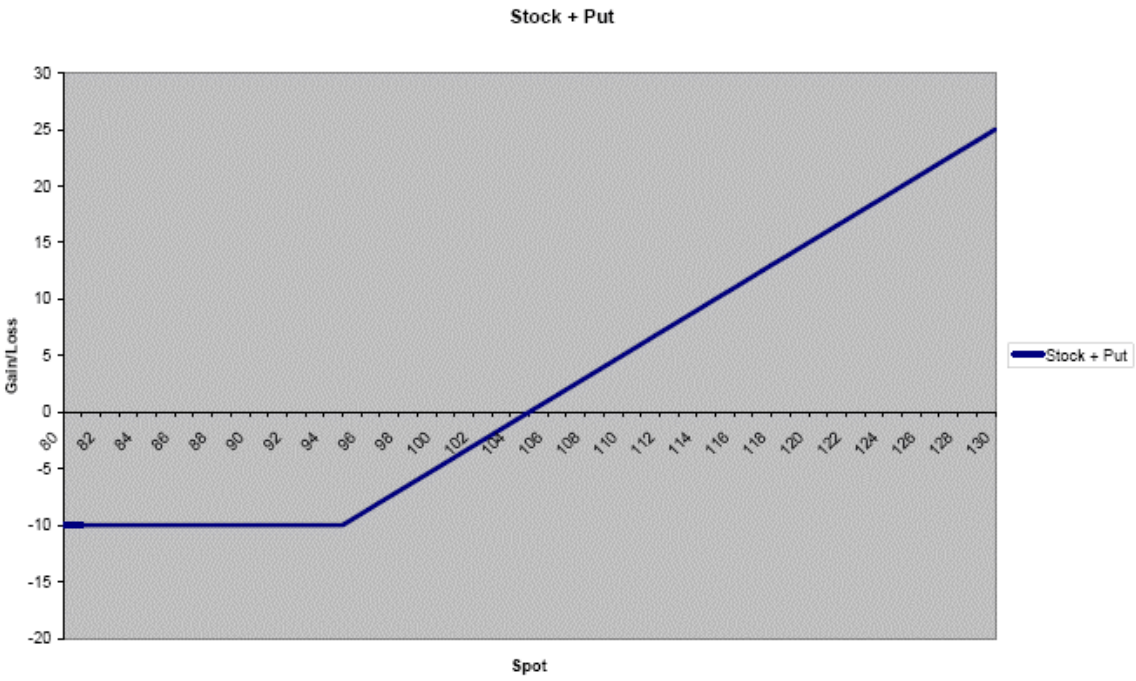

Figure 9: Stock plus Put Graph

Hedgers need to remember that, prior to expiry, the mark-to-market of the option may not match that of the underlying stock exposure. The reason for this is that the option probably does not move one-for-one with movements in the stock price. In other words, the sensitivity of the option with respect to the stock will not necessarily be equal to a value of 1. Market professionals call this sensitivity the 'delta'. An option that is a long way out-of-the money will have a delta close to zero (the option premium will hardly change for a given change in the stock), an option a long way in-the-money will have a delta close to one (the option premium will change by $ 1 for every $ 1 change in the stock price) and at-the-money option will have a delta of around 0.5 (the option premium will change by around $ 0.5 for every $ 1 change in the stock.

The size of the call delta as spot varies can be seen in the figure below. At low levels of spot the delta is small, but at high levels the delta is large.

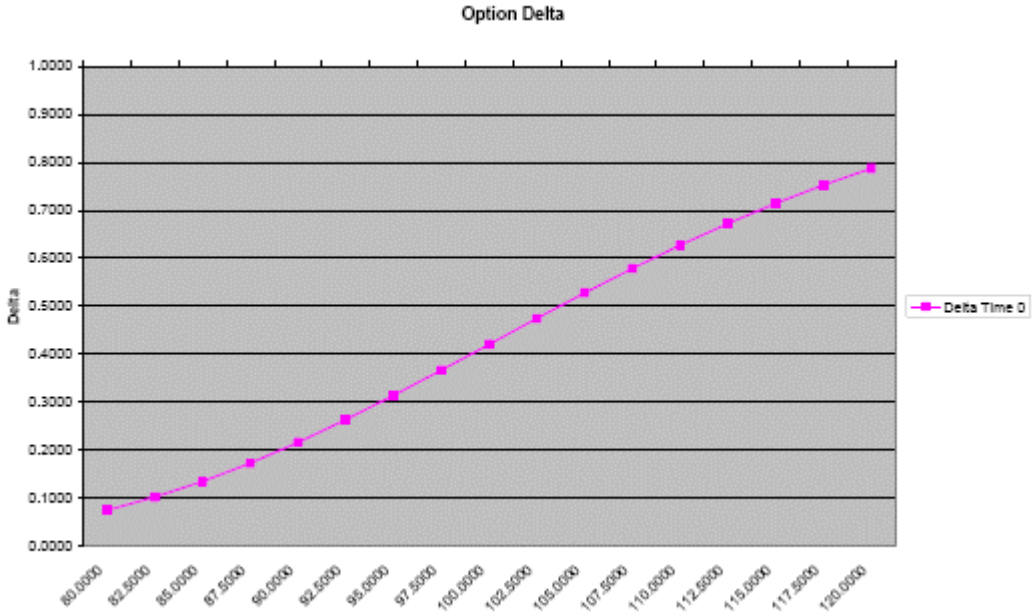

Figure 10: Option Delta (Time = 0) Graph

Interestingly, the delta profile also changes over time, as in the figure below. Notice that the rate of the change of the delta close to expiry and near the at-the-money strike can be very rapid. This is known as "gamma" (gamma represents the sensitivity of the delta to changes in the stock price), and shows that the value of the option delta can change very rapidly near maturity and at-the-money.

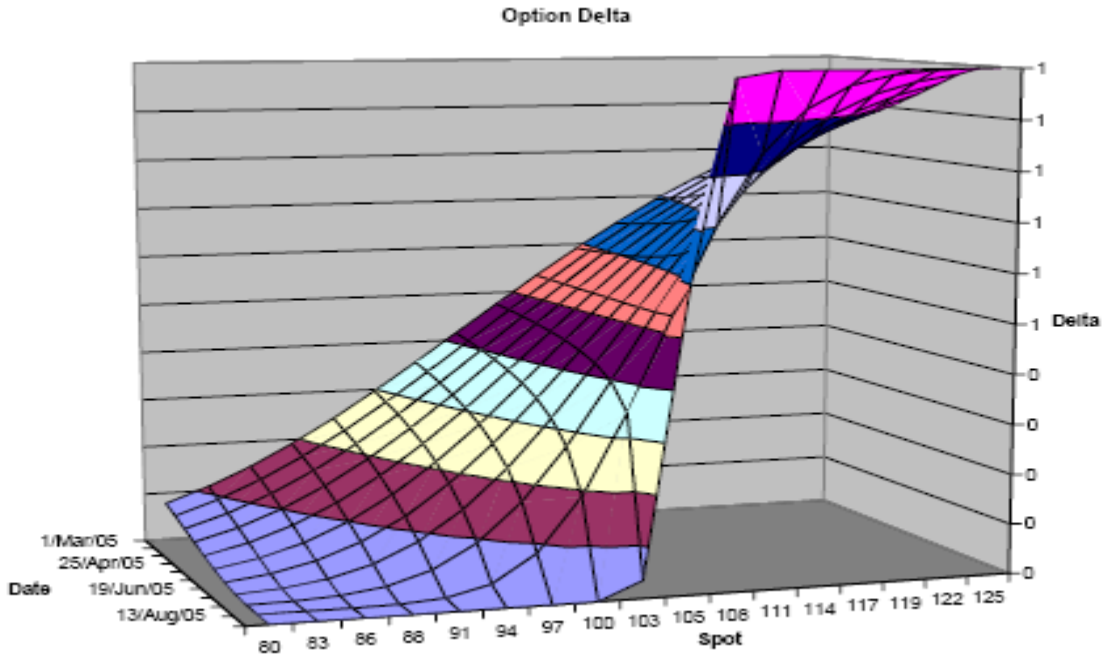

Figure 11: Option Delta Graph

The gamma profile is shown below. It shows very clearly how the change in the delta spikes near maturity if the option is close to the money. This is known as "Gamma risk" as rapid changes in delta, which require frequent hedging activity, can be costly to a trader in terms of transaction costs.

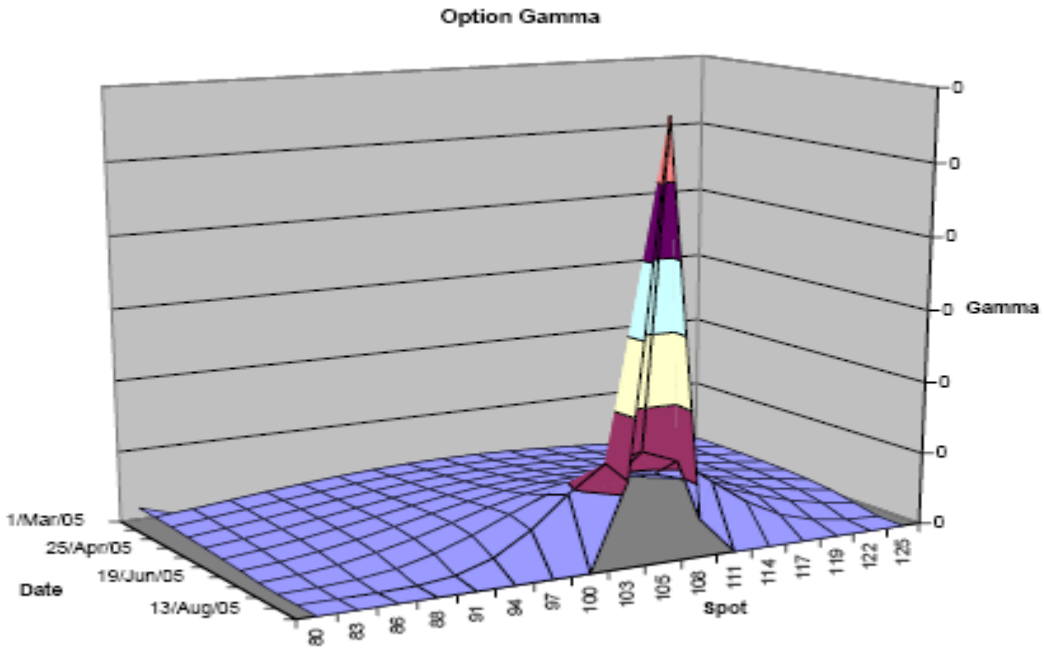

Figure 12: Option Gamma Graph

One way of protecting a stock, index or portfolio position, while reducing the cost of the upfront premium paid is to use collar (also called a risk reversal). With the collar, earning a premium by selling a call offsets the premium paid for buying the put. The strikes can be chosen such that the net premium is zero. In the simplified example that is used, the $ 105 strike call and the $95 strike put have the same premium cost of $5, so buying the put and selling the call would give a zero cost hedge, as in the figure below. Note that the blue line in the diagram is the full combination profile for owning the stock, buying the put and selling the call. Of course, there is never something for nothing, and the hedger will give away some upside potential of the stock price rising by selling the call. On the other hand, zero-cost currency options collars are used as a tool to limit the range of borrowing costs.[26]

[26] D. Vander Linden, "Denomination of currency decisions and zero-cost options collars," J. of Multi. Fin. Management, 15, 2005, 85 – 98

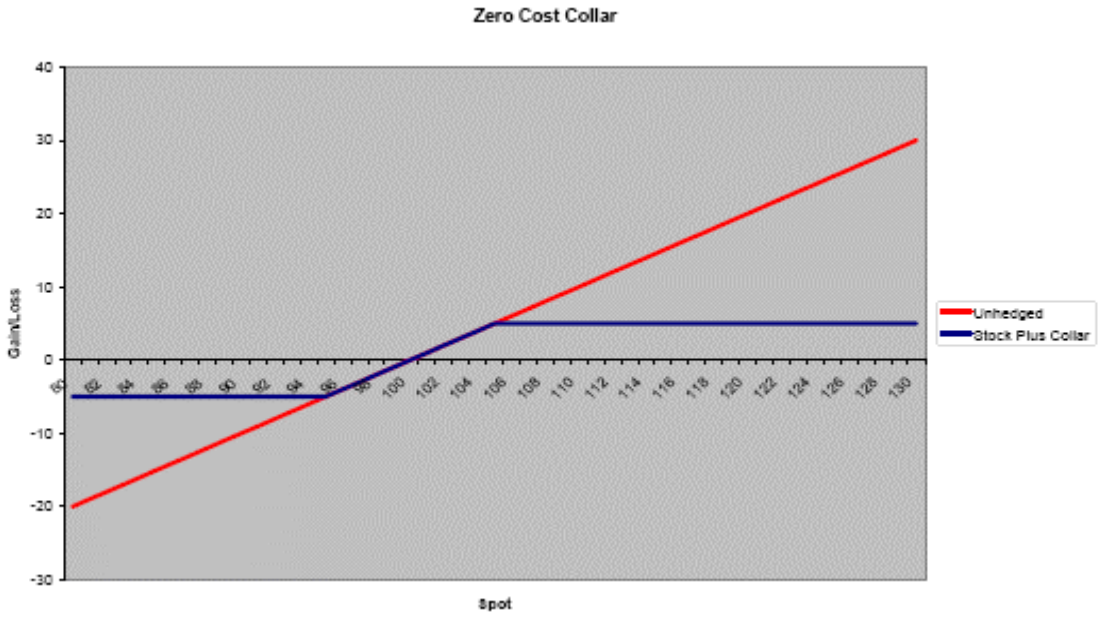

Figure 13: Zero Cost Collar Graph

The figure below shows how the collar hedge would perform over time.

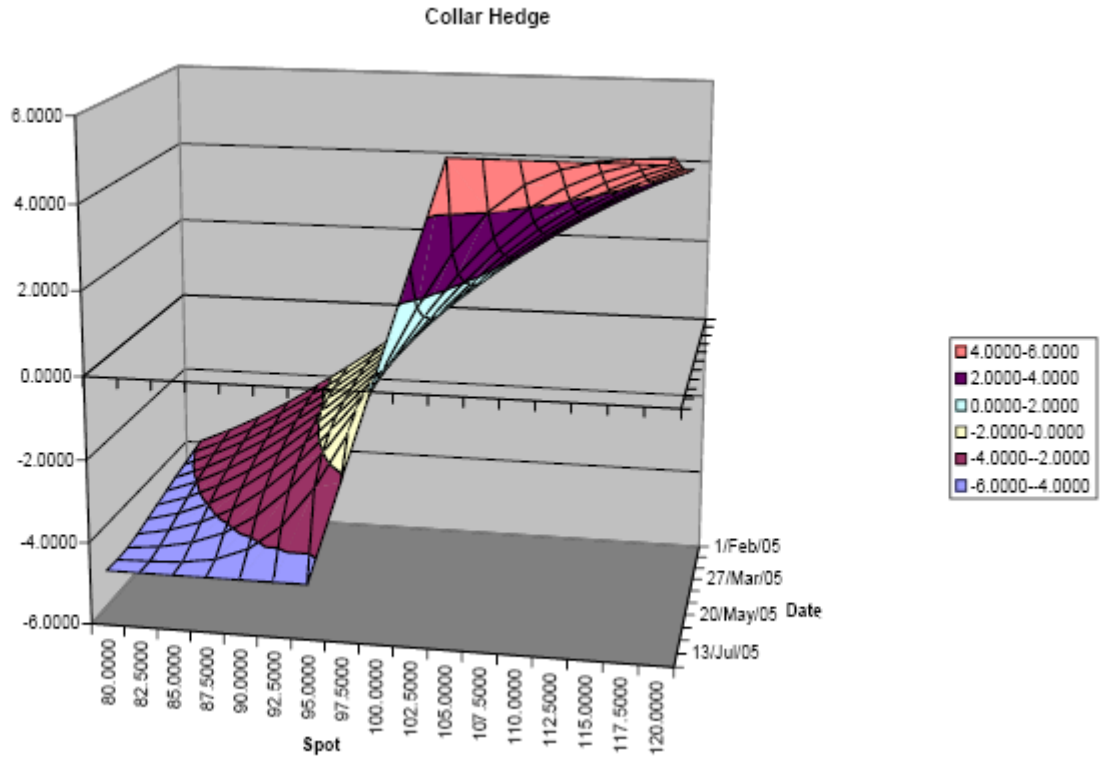

Figure 14: Collar Hedge Graph

The strikes at which a user can trade a zero-premium collar can be strongly affected by the level of implied volatility skew in the market.

2.2. Option Spreads*

There are a number of strategies that can be used to trade the equity option markets and volatility using standard options. Nevertheless; very often, option strategies, such as bull spread, straddle, butterfly, buy and sell ratio spread, etc., are decided in advance, given one's own beliefs about the future price of the underlying asset.[27]

Here are a few of them,

- Bull spread – this involves buying a more valuable (lower strike) call and selling a less valuable (higher strike) call. Also referred to as a call spread

- Bear spread – suitable when one is bearish on the market. Sell an out-of-the- money put to help fund a long higher strike put position. Also referred to as a put spread.

- Calendar spread – useful for making a specific timing call, e.g. looking for the shape of the volatility surface to change rapidly between months. Involves buying and selling options of different maturities.

- Straddle – buying a call and buying the same strike (and expiration) put is being long a straddle

- Strangle – buying a call and a put (with a different strike but the same expiration - if they have the same strike price this would be a long straddle) is being long a strangle.

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* For further information about options spread please visit www.asx.com.au/options

[27] C. Papahristodoulou, "Option strategies with linear programming," European Journal of Operational Research, 157, 2004, 246 – 256

- Butterfly – made up of calls and puts. Normal: long a straddle and sell a strangle.

2.3. Black - Scholes Pricings Formula

The long history of the theory of option pricing began in 1900s when the French mathematician Louis Bachelier deduced an option pricing formula based on the assumption that stock prices follow a Brownian motion (random movements) with zero drift.[28] However, up to 1973, none of theory had a huge influence on traders.

*"*In the early 1970s, Fischer Black, Myron Scholes, and Robert Merton made a major breakthrough in the pricing of stock options. This involved the development of what has become known as the Black - Scholes (or Black - Scholes - Merton) model. This model has had a huge influence on the way that traders price and hedge options."[29]

Robert C. Merton was the first to publish a paper expanding our mathematical understanding of the options pricing model and coined the term "Black-Scholes" options pricing model, by enhancing work that was published by Fischer Black and Myron Scholes. The paper was first published in 1973. The foundation for their research relied on work developed by scholars such as Louis Bachelier, A. James Boness, Edward O. Thorp, and Paul Samuelson. Merton and Scholes received the 1997 Nobel Prize in Economics for this and related work; though ineligible because of his death in 1995, the Swedish academy broke with tradition and mentioned Black as a contributor.[30]

"If options are correctly priced in the market, it should not be possible to make sure profits by creating portfolios of long and short positions in options and their underlying stocks. Using this principle, a theoretical valuation formula for options is derived. Since almost all corporate liabilities can be viewed as combinations of options, the formula and the analysis that led to it are also applicable to corporate liabilities such

[28] Merton, Robert C., "Theory of Rational Option Pricing," Bell Journal of Economics and Management Science, 4, 1, Spring 1973, 141 – 183

[29] Hull, Fifth Edition, 2002

[30] http://nobelprize.org/nobel_prizes/economics/laureates/1997/

as common stock, corporate bonds, and warrants. In particular, the formula can be used to derive the discount that should be applied to a corporate bond because of the possibility of default."[31]

The concepts underlying Black-Scholes are,

- The option price and the stock price depend on the same underlying source of uncertainty
- We can form a portfolio consisting of the stock and the option which eliminates this source of uncertainty
- The portfolio is instantaneously risk less and must instantaneously earn the risk - free rate

The Black - Scholes model for valuing European call and put options on a non-dividend-paying stock is presented below.[32]

$$c = S_0\, N(d_1) - K\, e^{-rT} N(d_2)$$

$$p = K\, e^{-rT}\, N(-d_2) - S_0\, N(-d_1)$$

$$\text{where} \quad d_1 = \frac{\ln(S_0 / K) + (r + \sigma^2 / 2)T}{\sigma\sqrt{T}}$$

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

[31] Black, Fischer; Myron Scholes, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy,* 81, 3, 1973, 637 – 654

[32] Black

The Model:

$$C = SN(d_1) - Ke^{(-rt)}N(d_2)$$

C = Theoretical call premium

S = Current Stock price

t = time until option expiration

K = option striking price

r = risk-free interest rate

N = Cumulative standard normal distribution

e = exponential term (2.7183)

$$d_1 = \frac{\ln(S/K) + \left(r + s^2/2\right)t}{s\sqrt{t}}$$

$$d_2 = d_1 - s\sqrt{t}$$

s = standard deviation of stock returns

ln = natural logarithm

N (x) is the probability that a normally distributed variable with a mean of zero and a standard deviation of 1 is less than x. It is also known as cumulative normal distribution for a standardized normal distribution.

Assumptions of Black - Scholes Model Formula are,[33]

- The stock pays no dividends during the option's life:
    - Most companies pay dividends to their shareholders, so this might seem a serious limitation to the model considering the observation that higher dividend yields elicit lower call premiums. A common way of adjusting the model for this situation is to subtract the discounted value of a future dividend from the stock price.

[33] Black

- European exercise terms are used
    - European exercise terms dictate that the option can only be exercised on the expiration date. American exercise term allow the option to be exercised at any time during the life of the option, making American options more valuable due to their greater flexibility. This limitation is not a major concern because very few calls are ever exercised before the last few days of their life. This is true because when you exercise a call early, you forfeit the remaining time value on the call and collect the intrinsic value. Towards the end of the life of a call, the remaining time value is very small, but the intrinsic value is the same.
- Continuous and constant interest rate.
    - The Black and Scholes model uses the risk-free rate to represent this constant and known rate. In reality there is no such thing as the risk-free rate, but the discount rate on U.S. Government Treasury Bills with 30 days left until maturity is usually used to represent it. During periods of rapidly changing interest rates, these 30-day rates are often subject to change, thereby violating one of the assumptions of the model.
- No Commission:
    - Usually market participants do have to pay a commission to buy or sell options. Even floor traders pay some kind of fee, but it is usually very small. The fees that Individual investor's pay is more substantial and can often distort the output of the model.
- Constant variance rate of return:

- This assumption suggests, returns on the underlying stock are normally distributed, which is reasonable for most assets that offer options.

- Frictionless markets:
  - Unlimited borrowing & short selling possibilities.

- No penalties to Short selling:
  - A seller who does not own a security will simply accept the price of the security from a buyer, and will agree to settle with the buyer on some future date by paying him an amount equal to the price of the security on that date.

In the project, valuing currency options will be needed and Black-Scholes formula can be used for this aim. So is defined as the spot exchange rate. Rf is the foreign risk free interest rate.

$$c = So\, e^{-Rf\,T} N(d1) - K\, e^{-RfT} N(d2)$$

$$p = K\, e^{-RfT} N(-d2) - So\, e^{-Rf\,T} N(-d1)$$

Where

$$d1 = \left(LN\left(So/K \right) + (R - Rf + \sigma^2/2)T \right) / (\sigma \sqrt{T})$$

$$d2 = \left(LN\left(So/K \right) + (R - Rf - \sigma^2/2)T \right) / (\sigma \sqrt{T})$$

In relation with research made, there are critics for Black-Scholes Model that foreign exchange options are a recent market innovation. The standard Black-Scholes option-pricing model does not apply well to foreign exchange options, since multiple interest rates are involved in ways differing from the Black-Scholes assumptions.

Alternative valuation formula for foreign exchange options were presented and Garman-Steven were one of them. These valuation formula have strong connections with the commodity-pricing model of Black (1976) when forward prices are given, and with the proportional-dividend model of Samuelson and Merton (1969) when spot prices are given.[34]

In fact, indiscriminately applying the Black and Scholes (1973) formula to both stock options and currency options yields the opposite pricing bias pattern. The Black-Scholes formula generally overprices out-of-the-money stock call options and underprices in- the-money stock call options[35], but it usually underprices out-of-the-money currency calls.[36] Another problem of applying stock option models to currency options is that the assumptions for stock option models may not be valid for currency options.[37]

The foreign exchange market is the largest financial market in the world. Currently, the average trading volume in foreign currencies exceeds 1.5 trillion US dollars per day. Hence, a deeper understanding of the exchange rate dynamics has important economic repercussions.[38]

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[34] Garman, Mark B. and Steven W. Kohlhagen, "Foreign currency option values," Journal of International Money and Finance, 2, 1983, 231 - 237.

[35] MacBeth, J.D. and Merville, L.J., "An empirical examination of the Black-Scholes call option pricing model," Journal of Finance, 34, 1979, 1173 – 1186.

[36] Bodurtha, J.N. Jr. and Courtadon, G.R., " Tests of an American option pricing model on the foreign currency option market," Journal of Financial and Quantitative Analysis, 22, 1987, 153 – 167

[37] *M. Cao ," Systematic jump risks in a small open economy: simultaneous equilibrium valuation of options on the market portfolio and the exchange rate," Journal of International Money and Finance, 20, 2001, 191 – 218*

[38] P. Carr and L. Wu, "Stochastic skew in currency options," Journal of Financial Economics, 2007, 1 - 34

2.4. Volatility

Volatility is one of the key drivers of option pricing, measured as the standard deviation of stock price log returns. The volatility of financial markets in particular is associated with risks and risk management is a significant consideration for investors, and hence an important area of modeling.[39] It is important to distinguish between historical volatility (based on past price movements) and implied volatility (volatility consistent with quoted option prices). Implied volatility for a particular option is a function of the supply and demand for that option. If there is high demand for calls, call volatility will rise, if there is low demand for calls, call volatility will fall. Implied volatility at a given strike can be interpreted as reflecting the market's expectations of what realized volatility would be if the underlying stock or index were to trade near that level.[40] Accurate measures and good forecasts of asset return volatility are critical for the implementation and evaluation of asset pricing theories, portfolio choice and risk management. Asset return volatility cannot be directly observed and is time-varying. As a result, economists have built increasingly sophisticated statistical models to capture the characteristics of financial markets' volatility.[41]

The idea of implied volatility being a good forecast of market expected volatility is generally accepted by the academia and traders. However, the methods for calculating it are still under some controversy.[42] When implied volatilities are low it will have a direct impact on the cost of hedging an underlying stock or index, when they are high the hedge will be more expensive. It is important to note that options of the same maturity and underlying can be quoted with different volatilities, depending on their strike. This is what is known as the 'implied volatility skew' in the market. Out – of – the - money puts tend to trade at higher implied volatilities than at-the-money calls

[39] K.F. Radalj, "Hedgers, speculators and forward markets: Evidence from currency markets," Environmental Modeling & Software, 21, 2006, 1381 – 1386

[40] A.T. Wang, "Does implied volatility of currency futures option imply volatility of exchange rates?," Physica A, 374, 2007, 773 – 782

[41] D.D. Thomakos and T. Wang, "Realized volatility in the futures markets," Journal of Empirical Finance, 10, 2003, 321 – 353

[42] M.Y. Takami and B.M. Tabak, "Chaos, Solitons and Fractals", 2007, 2 – 9

and puts. The behavior of out – of – the – money call implied volatilities could vary between single stocks and indices. This is a reflection of the fact that traders are aware that the models used to price options can under-estimate the likelihood of large price falls or, to some extent, large price rises, and therefore they manually change the volatilities used to price these options. For equity options, the smile is often skewed towards out - of – the - money puts because there is demand for these to hedge equity portfolios. For example, the screenshot figure below from the DB Equity Derivatives site shows the skew for the FTSE100 Index.

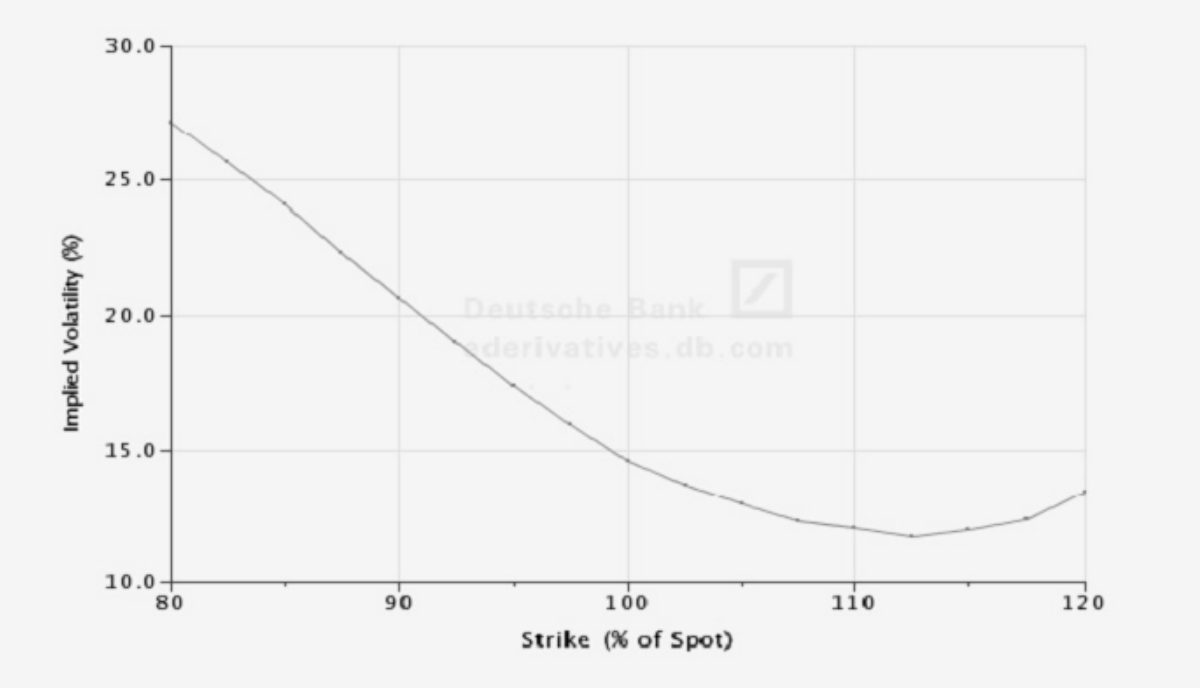

Figure 15: The implied volatility Skew Graph (Deutsche Bank)

Source: Bender Securities "Options" Booklet, 2006

The efficient market hypothesis views price volatility as a result of the random arrival of new information, which changes returns.[43] For particular stocks and indices it is sometimes seen a "smile" rather than skew, where upside call implied volatilities are

[43] *A.H. Tu and M.-C. Wang, "The innovations of e-mini contracts and futures price volatility components: The empirical investigation of S&P 500 stock index futures" Int. Fin. Markets, Inst. and Money, 17, 2007, 198 – 211*

substantially higher than at – the - money. For single stocks this can be the case in names where there is speculation that the company could be taken over and the share price might rise sharply. Relative Value traders, prop traders (that want to trade other people's money for a living) and hedge funds will all tend to trade the volatility skew. In addition, skew and its shape can be important for hedgers because it will be the main factor in the cost of hedges, for example in the relative cost of calls and puts in the collar hedge strategy explained earlier.[44]

2.5. Current Needs of Turkish Financial Markets

The alternative derivative product can be any derivative (forward, future, option, swap), which will be really demanded by Turkish Market. In figures 16 and 17, main currency USD value fluctuation is depicted in previous years. Although exchange rates seem stable in last 4-5 years when looking at the year-to-year data, it is seen the daily increases or decreases in short periodic data. Recent liquidity crisis in global markets mainly comes from USA mortgage market has fluctuated the ISE and exchange rates in Turkey more serious than the others in the world that a similar one lived in May 2006. On the other hand, Standard & Poor's has reported Turkey was the one of the vulnerable markets that the last worldwide financial crisis would have hit first if it had deepened.[45]

[44] J.C. Hull and A. White, "Value at Risk When Daily Changes in Market Variables Are Not Normally Distributed," Journal of Derivatives, 5,no. 3 (Spring 1998), 9 – 19

[45] M. Khor, "Uncertainty Rules as Financial Volatility Spreads Worldwide," TWN Info Service on Finance and Development, 14 August 2007

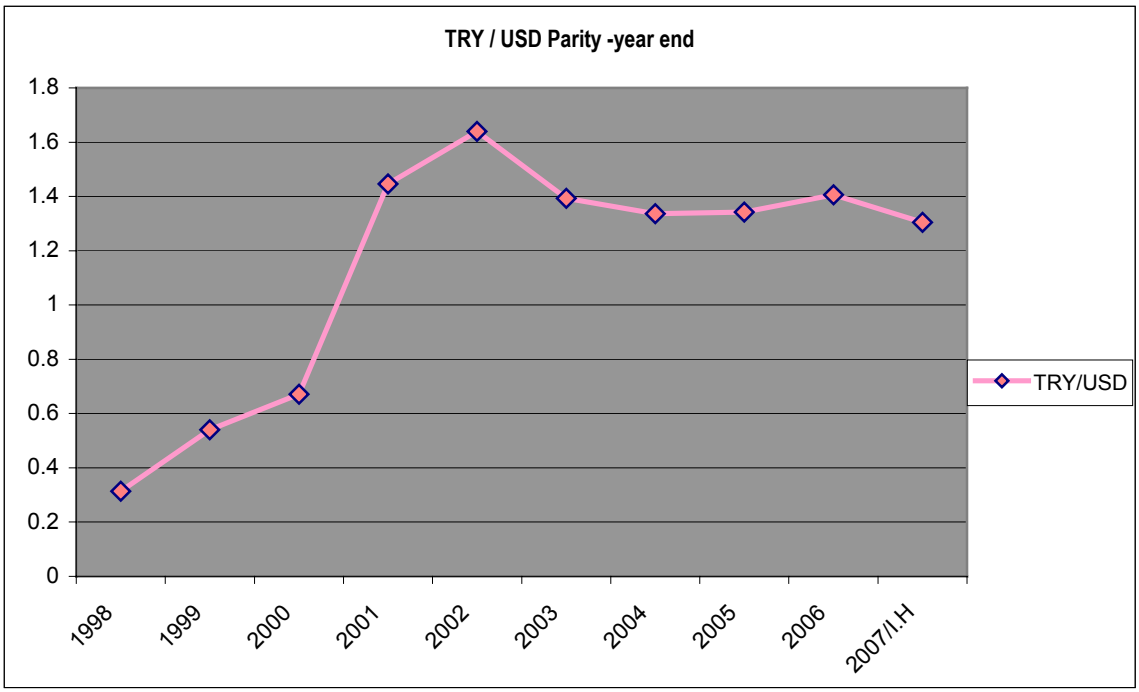

Figure 16: Yearly fluctuations of TRY / USD between 1998 to present

Source: The data of figure is taken from Central Bank of Turkey Web Site

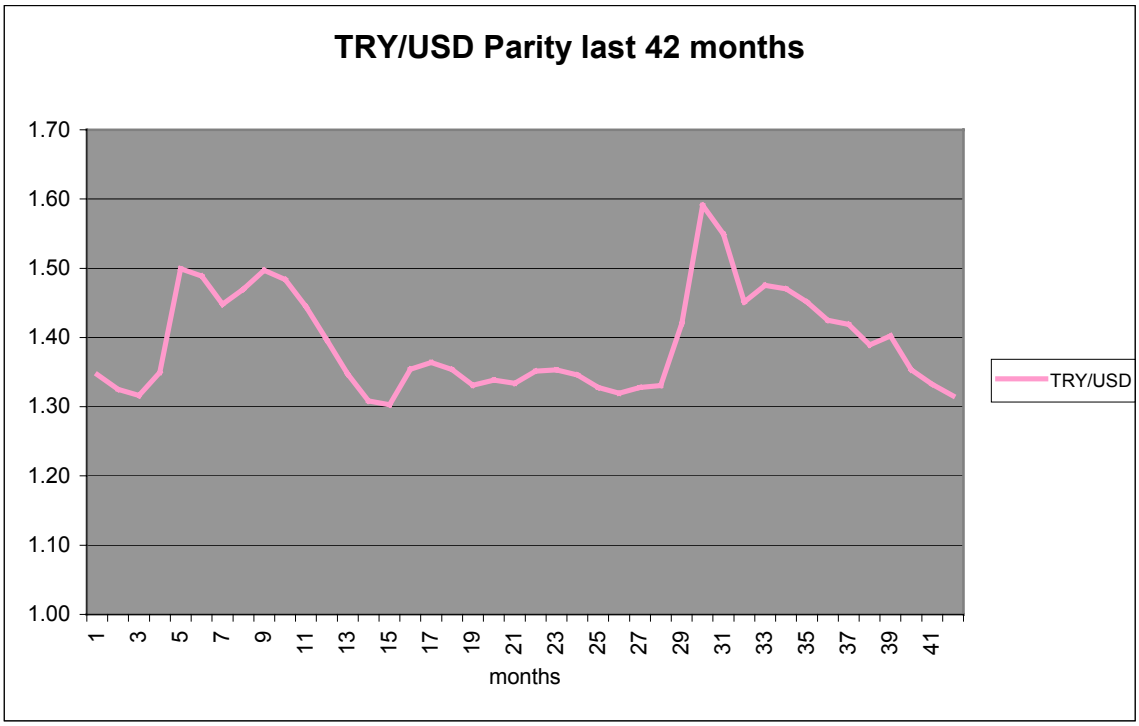

Figure 17: Monthly fluctuations of TRY / USD between 2004 to present

Source: The data of figure is taken from Central Bank of Turkey Web Site

3. RESEARCH DESIGN & METHODOLOGY

3.1. Objective

The financial derivatives are very fresh topic for Turkish Financial Markets that should be presented very well to the people and investors to increase using of these complicated financial tools. It would help to have stable financials and to deepen the economy.

As a forward contract is the simplest derivative and generally traded in the over – the - counter (OTC) market, this area is perceived as having limited value creation opportunity. Different from forwards, future contracts are traded on an exchange, as they are contracts with standardized features[46]. Commodities and financial assets form the underlying assets in futures. The commodity futures traded in TURKDEX are cotton, gold and wheat futures. Underlying financial assets are ISE-100, ISE-30, Treasury bonds (365 & 91 dates), and TRY/USD and TRY/EUR exchange rates. As futures are standardized contracts, it is not aimed to create new future strategy for the Turkish market.

Options are fundamentally different from other derivatives. While options imply the right to do something, forwards, futures and swaps imply an obligation. Options can be classified as stock options, foreign currency options, index options, future options, exotic options and real options.

Based on the research made, it is focused on options and particularly on foreign currency options in testing an alternative strategy for Turkish market that is parallel to the aim creating stabilizer financial tool for the currency market. One possibility is to create an option on a particular foreign currency "USD". It is worked for this end and utilized data mining techniques to determine whether any trends are observable, based on historical data. Following these, a currency option is created for pessimistic and optimistic expectations. The option is priced based on the current price, the strike price, the expiration date, the price volatility, and the risk-free interest rate. For this aim, the

[46] Hull, Fifth Edition, 2002

Black - Scholes option pricing formula are used. Price will be determined for both call and put option. After an option is created, it has been focused on multi trading strategy.

Some trading strategies involve a single option, while other requires taking a position in two or more options.

Combination trading strategies may be,

- A bull: buying a call (put) with a low strike price and selling a call (put) with high strike price.

- A bear: buying a call (put) with a high strike price and selling a call (put) with a low strike price.

- A butterfly: buying calls (puts) with a low and high strike price and selling two calls (puts) with some intermediate strike price.[47]

One step forward is to create strategy including a multi options. The strategy includes different weighted options depending on whether they are designed for risk-averse or risk taker investors. The final stage of strategy is an excel spreadsheet including macro, which enables user to determine the price of an option, figures, and level of strategies that differentiated by weights of option positions.

47 Hull, Fifth Edition, 2002

3.2. Design of Research

As is observed in the project definition part, currency fluctuation protecting strategy is limited to options only and the factors for that limitation is given. However, the scope is based on two principles.

The Market Principle brings efficiency to the alternative strategy development process. Testing a derivative is not so challenging because ready formula is available to price the derivative written on any underlying asset. The principle brings the challenge by stating that tested strategy should serve the needs of Turkish Market. Testing a currency option with profitable trading strategy that suits Turkish Market will be challenging.

The last principle limiting the scope is "Imitating International Markets". A strategy can be tested based on analysis of International Derivative Markets. Given that TURKDEX is less developed vis-à-vis International Markets, imitating International Markets is real opportunity.

3.3. Data

The data for day – end exchange rates for TRY / USD was taken from the Central Bank of the Republic of Turkey web site. The exchange rates between dates of 05.04.2004 – 06.04.2007 were used for calculations that needed for applying Black & Scholes Model, however, back testing has been done for the period between April 2005 and March 2007. Recent period data was used to have up – to - date results for defend the strategy in comfort.

Needed data has been sorted and the figures have become more meaningful with the usage of Black & Scholes Model in excel. The required figures have been produced for valuation of options and the strategies were applied one by one.

3.4. Methodology

It is clear that being systematic in testing strategy process would be a key success factor. Thus it is defined some footsteps to pass by the time in terms of methodology. During the project, a four-step project methodology is followed. These four steps can be listed as:

- Interpreting the markets
- Developing a pool of strategies
- Defining characteristics of strategy and testing the strategy
- Back testing the strategy

3.4.1. Interpreting the Markets

In the initial step, "interpreting the markets", it is focused on two general markets: domestic markets and international markets. Under domestic market interpretation, the tables of Istanbul Stock Exchange, Fixed Income (Sabit *Getirili Menkul Kıymetler* – SGMK) and TURKDEX (Vadeli Opsiyon Borsası) are analyzed.

The daily volumes of domestic markets are,

- ISE daily volume is approximately 1 trillion TRY
- Fixed income market daily volume is approximately 1.1 trillion TRY
- TURKDEX daily volume is approximately 0.5 trillion TRY

ISE is the largest stock exchange in Turkey, in which stocks of public companies are traded. The most popular index is ISE-100. The fixed income securities include government bonds in different currencies, mostly in TRY. TURKDEX is a

developing market, also interpreted from the daily volume comparison, and is very promising considering the importance of derivatives markets all around the world.

When studying the international markets, the framework of the transactions and the way they function are analyzed. USD and EUR currencies also play a significant role in the Turkish market. Considering the dependency of local industries to foreign currency, the economy relies highly to these currencies. In recent years, with the increase in volume of foreign currency based credits of especially reel sector and high current account deficit as lasting problem.

3.4.2. Developing a Pool of Strategy

This stage is the one in which meetings with some finance specialists and expert colleagues for a think tank have been held to discuss the needs of Turkish markets and also about a stabilizer or hedging need of the market. Most of people with whom these topics were discussed stated an exchange rate risk stabilizer is one of the essential needs of Turkish Financial Markets. Many ideas and views, that are reviewed, helped to reach the target in the way creating a strategy. What the possible features of the strategies should be were so rough and general in this stage.

3.4.3. Characteristics of the Strategy

In the third stage, it is passed to the "strategy characteristics definition and selection from the pool". Following the preparation of a small summary on possible strategy idea, it is consulted some critics to get some reflections. With the positive comments, moreover, the volatility in the market provides some important profitable investment opportunities for the investors. All these feedbacks lead to concentrate on some of the products that fit to the clues and reflections, which were received. The general characteristics defined for this stage can be listed as:

- It has to protect from foreign currency fluctuations

- Low risk profile would be better considering the general characteristics of investors.

- Profit level should differ according to risk taking behaviour in a volatile market conditions is also important because of the fact that Turkish Market is volatile most of the time.

Following the third stage, more clear ideas arise about what the market demands and what can be supplied to the market with the knowledge and possibilities owned.

3.4.4. Back Testing

In the final stage of project methodology "back testing" is made. The created versions of the products are back tested for the past two years. In back testing the value of USD versus TRY is used as the data. The initial date for back testing is 01.04.2005. The strategy was set as to make a one month long period back testing for all twenty-four months. The results of these back-testing efforts are used to give the investor a general idea about the strategy. The back testing results in the following pages has given the profit & loss table of tested options strategy.

3.5. Research

The tested alternative strategy is consisting of an option strategy, which has 3 types that differs according to risk taking behaviors of people.

In the option strategies, the strategy is a modified straddle. In a straddle, the graphical representation is symmetric, but in this strategy symmetry has to be changed in order to adopt the strategy to the market. In fact, the alternative trading strategy proposed is fundamentally different than straddle, strip (one long call and two long puts with the same strike) and strap (two long calls and one long put with the same strike).

The one similarity between these option-trading strategies and the alternative option trading strategy is that both of them are bet on volatility. The alternative option trading strategy is not only more complex than European plain vanilla option trading strategies, but also it is unique to the Turkish foreign exchange market.

3.5.1. Option Strategies

3.5.1.1. "The Rabbit" Option Strategy:

The underlying of the strategy is USD/TRY parity and it bets on the volatility of the parity. Assuming that the spot rate is 1.4, the strategy requires transactions depicted in the Table 2.

Table 5

Options that construct the strategy

1.30	1.35	1.40	1.45	1.45	1.55
SELL	SELL	BUY	BUY	BUY	BUY
PUT	PUT	PUT	CALL	PUT	CALL

If the transactions of these options are made with equal weights, the profit/loss occurs as in Figure 18.

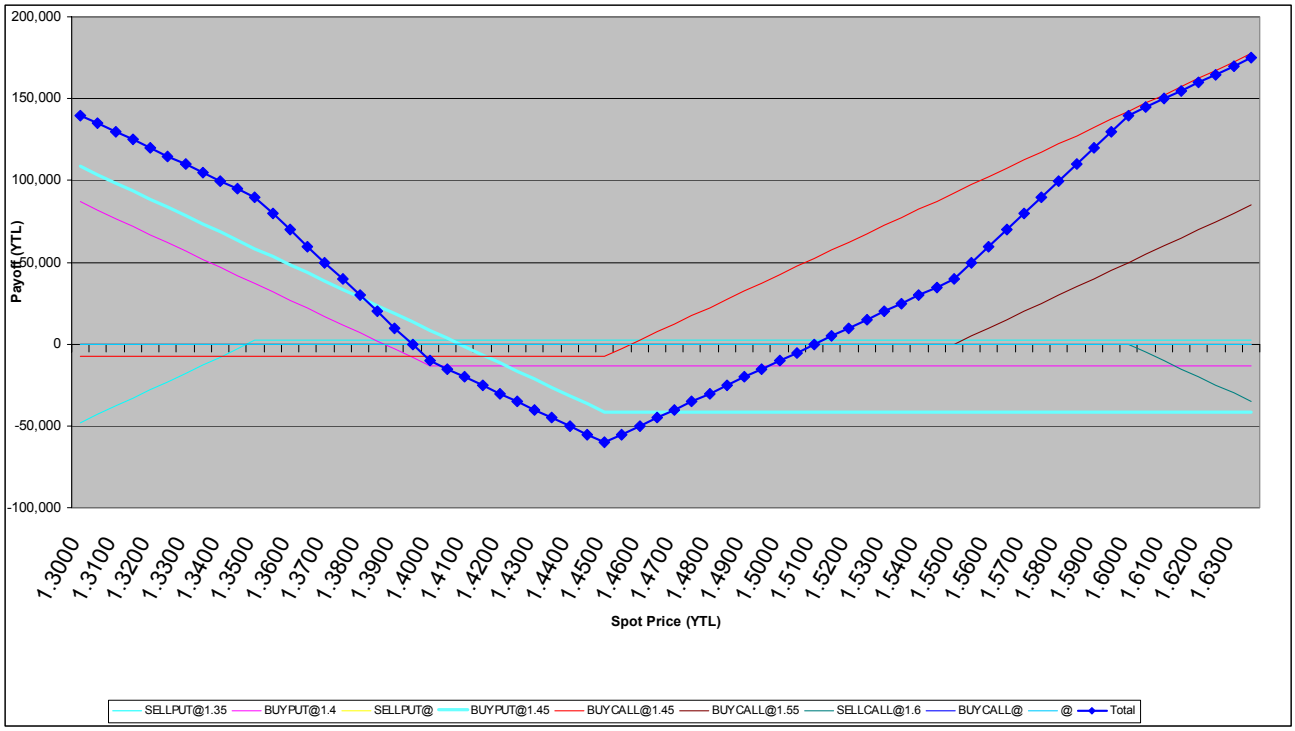

Figure 18: The Profit/ Loss graph of the strategy under equal weights

However, "The Rabbit" option strategy gives following weights to options bought and sold:

- **1 sell put @ 1.30**
- **2 to sell put @ 1.35**
- **3 to buy put @1.40**
- **3 to buy call @ 1.45**
- **1 to buy put @1.45**
- **1 to buy call @1.55**

When the options are traded according to the weights given above, the Profit/ Loss graph comes out as in Figure 19.

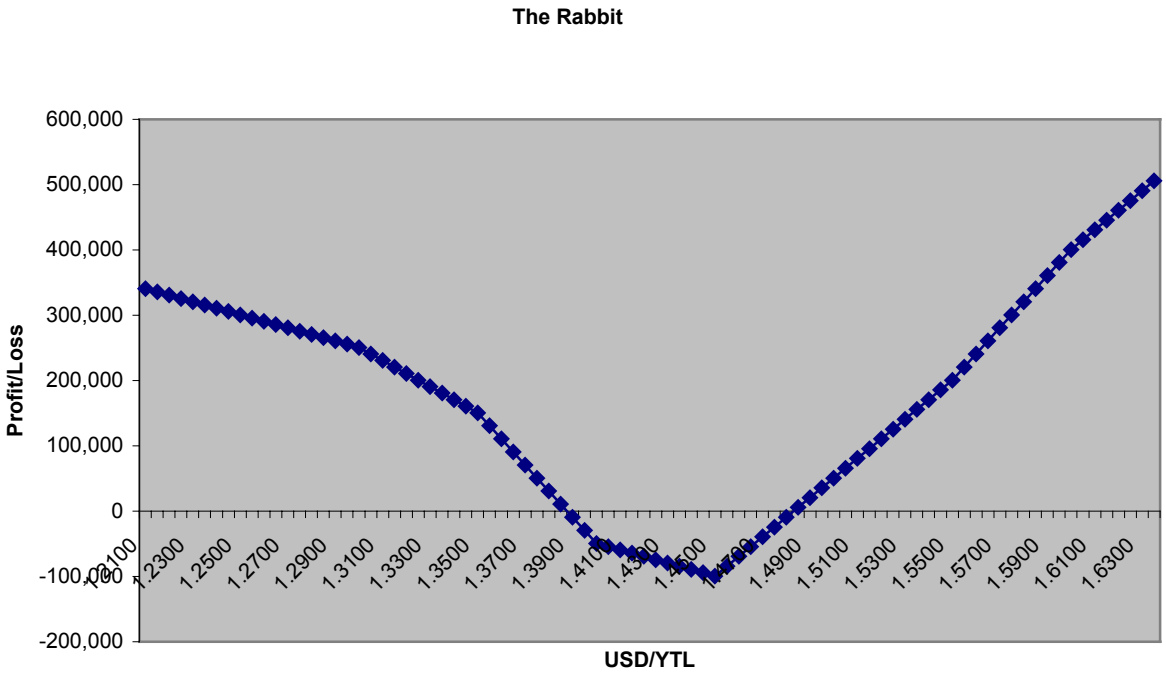

Figure 19: Profit/Loss for the Rabbit Option Strategy

It is crucial to observe that the investor begins to make profit in case of 1.07% appreciation (1.385) or 6.07% depreciation of TRY (1.4850) vis-à-vis USD. When the parity is above 1.5 and below 1.38, the investor makes huge profit. The maximum loss, the investor may incur is **99.324** TRY, and the maximum profit could reach **505.676** TRY.

3.5.1.2. "The Duck" Option Strategy:

The underlying of the strategy is USD/TRY parity and it is bet on the volatility of the parity. Assuming that the spot rate is 1.4, the strategy requires transactions depicted in the Table 3.

Table 6

Options that construct the strategy

1.30	1.35	1.40	1.45	1.45	1.55
SELL	SELL	BUY	BUY	BUY	BUY
PUT	PUT	PUT	CALL	PUT	CALL

If the transactions of these options are made with equal weights, the profit/loss occurs as in Figure 20.

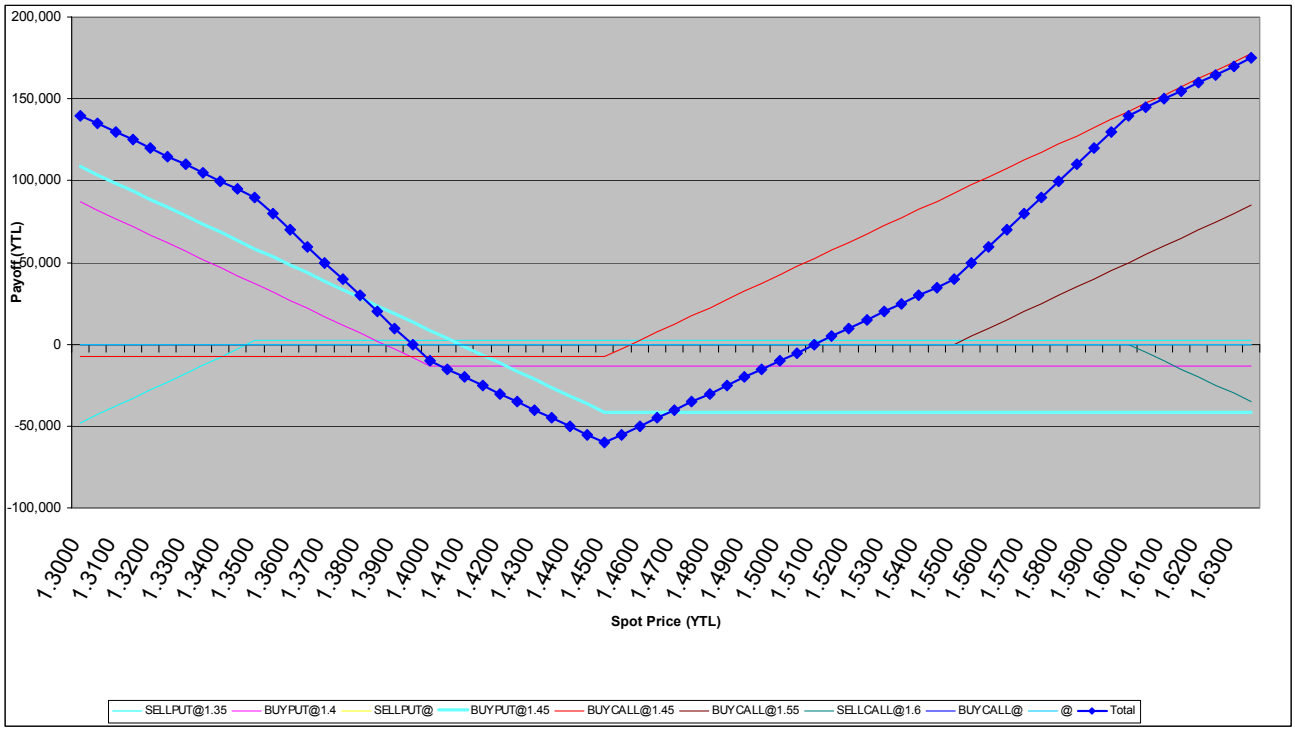

Figure 20: The Profit/ Loss graph of the strategy under equal weights

However, "The Duck" option strategy gives following weights to options bought and sold:

- **1 sell put @ 1.30**

- **2 to sell put @ 1.35**
- **3 to buy put @1.40**
- **4 to buy call @ 1.45**
- **1 to buy put @1.45**
- **2 to buy call @1.55**

When the options are traded according to the weights given above, the Profit/ Loss graph comes out as in Figure 21.

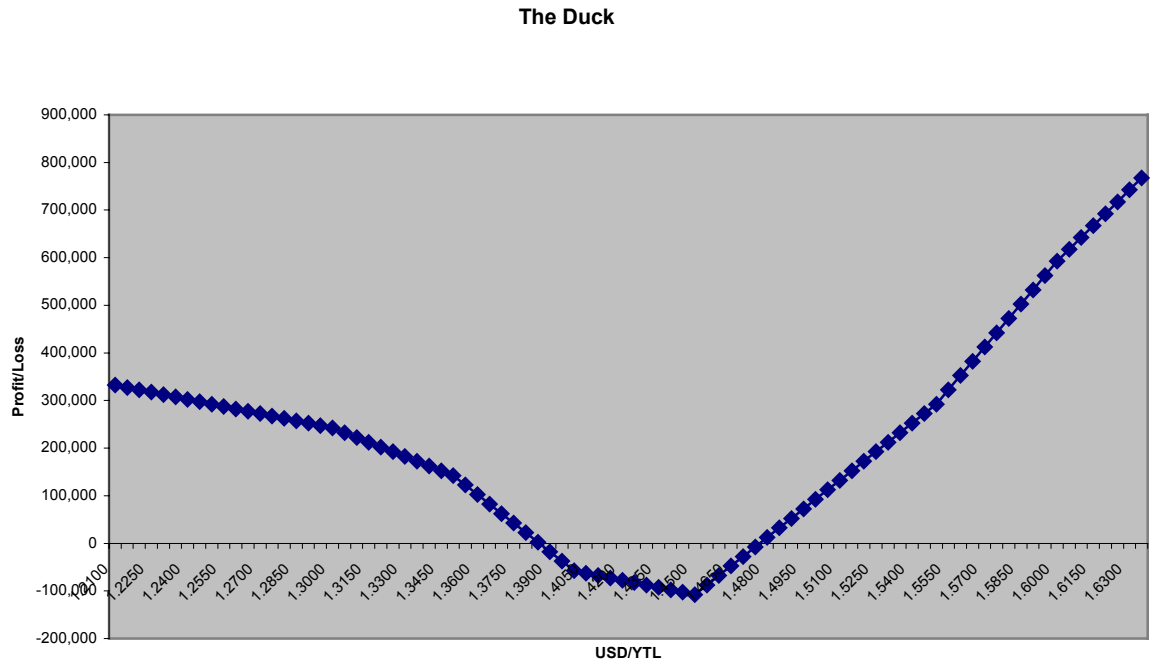

Figure 21: Profit/Loss for the Duck Option Strategy

It should be noted that the investor begins to make profit in case of 1.07% appreciation (1.380) or 5.71% depreciation of TRY (1.4800) vis-à-vis USD. When the

parity is above 1.49, the investor makes huge profit. The maximum loss, the investor may incur is **107.589** TRY, and the maximum profit could reach **767.411** TRY.

3.5.1.3. "The Deer" Option Strategy:

The underlying of the strategy is USD/TRY parity and it is bet on the volatility of the parity. Assuming that the spot rate is 1.4, the strategy requires transactions depicted in the Table 4.

Table 7

Options that construct the strategy

1.30	1.35	1.40	1.45	1.45	1.55
SELL	SELL	BUY	BUY	BUY	BUY
PUT	PUT	PUT	CALL	PUT	CALL

If the transactions of these options are made with equal weights, the profit/loss occurs as in Figure 22.

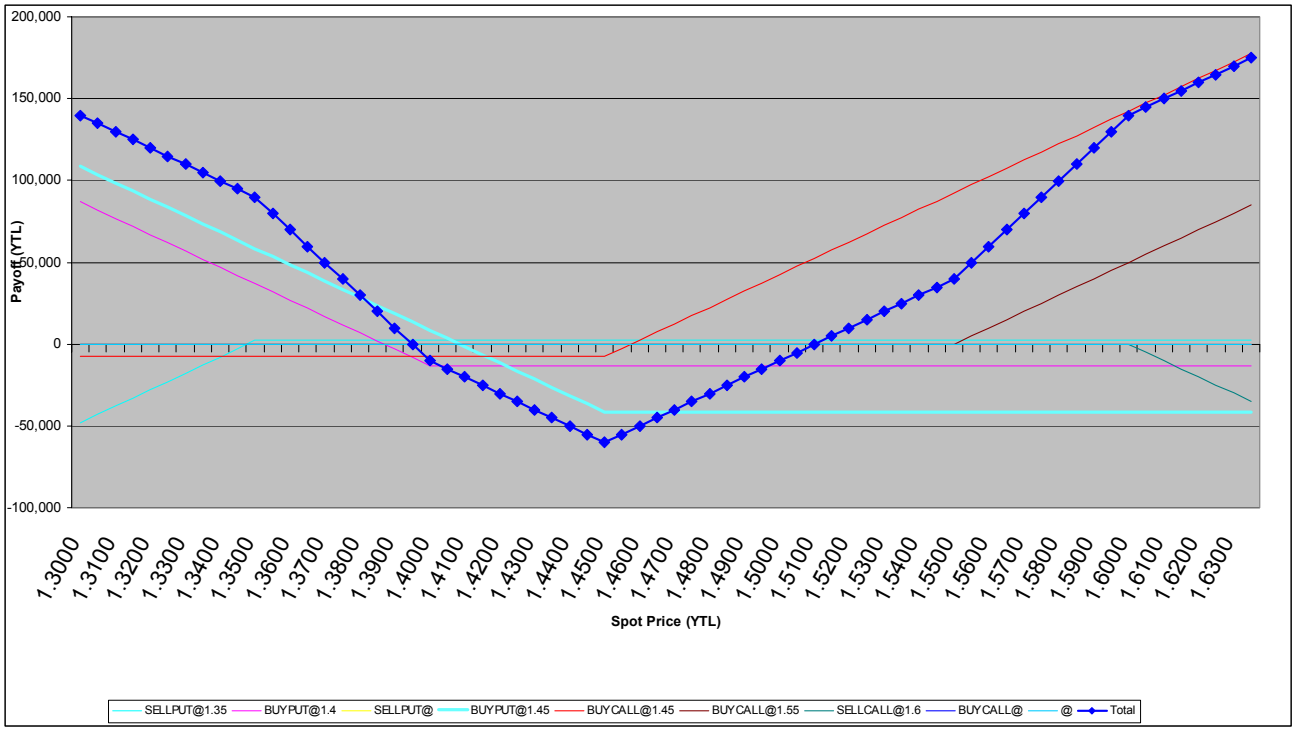

Figure 22: The Profit/ Loss graph of the strategy under equal weights

However, "The Deer" option strategy gives following weights to options bought and sold:

- **1 sell put @ 1.30**
- **2 to sell put @ 1.35**
- **4 to buy put @1.40**
- **4 to buy call @ 1.45**
- **1 to buy put @1.45**
- **2 to buy call @1.55**

The Profit/ Loss graph is depicted in Figure 23.

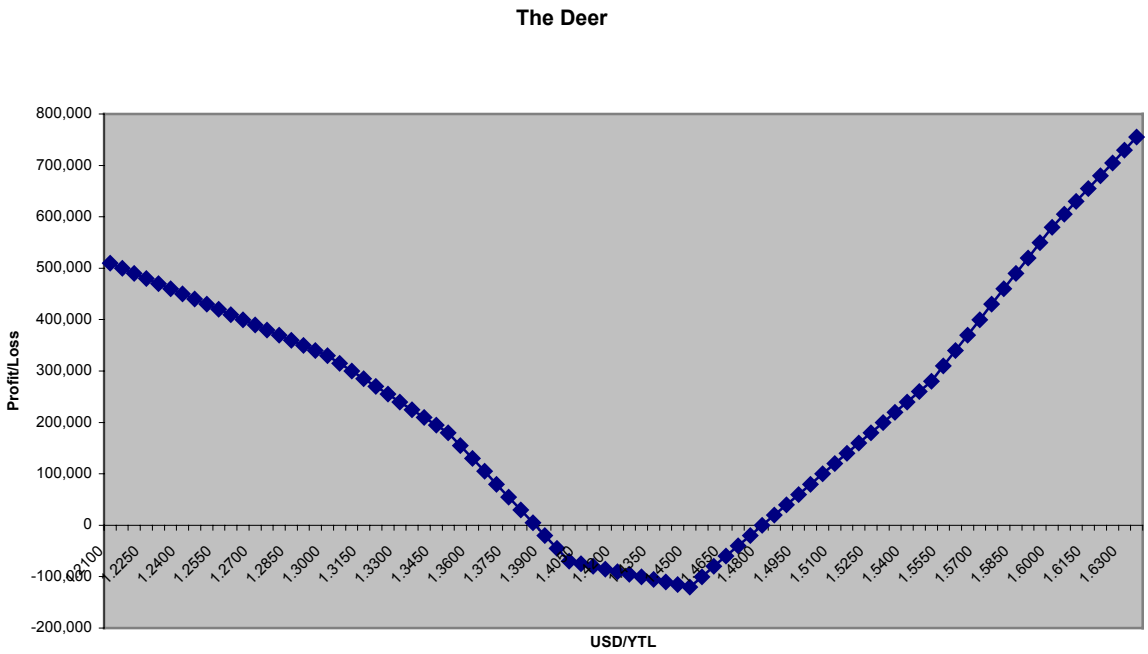

Figure 23: Profit/Loss for The Deer Option Strategy

It is crucial to observe that the investor begins to make profit in case of 1.07% appreciation (1.380) or 6.07% depreciation of TRY (1.4850) vis-à-vis USD. When the parity is above 1.49, the investor makes huge profit. The maximum loss, the investor may incur is **120.134** TRY, and the maximum profit could reach **754.866** TRY.

3.5.1.4. Back-Testing for Option Strategies

Three different products were tested for the period between April 2005 and March 2007.

- Total profit is calculated by simply adding the loss and profits of twenty-four months.

- Average loss is calculated by using the losses in non-profitable months. (Profitable months not included.)

- Average profit is calculated by using the profits in profitable months. (Non-profitable months not included.)

For the test period, all products are profitable. The total profits of twenty-four months are,

- For The Rabbit: 524.300 TRY

- For The Duck: 551.579 TRY

- For The Deer: 589.640 TRY

Table 8

Back testing results for option strategies

1 RABBIT				2 DUCK				3 DEER			
Date	Initial Parity	Final Parity	Profit/Loss	Date	Initial Parity	Final Parity	Profit/Loss	Date	Initial Parity	Final Parity	Profit/Loss
Apr-05	1.3535	1.3810	-83,674	Apr-05	1.3535	1.3810	-83,738	Apr-05	1.3535	1.3810	-96,640
May-05	1.3810	1.3580	35,077	May-05	1.3810	1.3580	27,822	May-05	1.3810	1.3580	35,624
Jun-05	1.3580	1.3330	64,507	Jun-05	1.3580	1.3330	57,577	Jun-05	1.3580	1.3330	72,598
Jul-05	1.3330	1.3190	-5,746	Jul-05	1.3330	1.3190	-12,289	Jul-05	1.3330	1.3190	-15,000
Aug-05	1.3190	1.3390	-55,757	Aug-05	1.3190	1.3390	-62,301	Aug-05	1.3190	1.3390	-75,011
Sep-05	1.3390	1.3350	-30,320	Sep-05	1.3390	1.3350	-36,986	Sep-05	1.3390	1.3350	-45,783
Oct-05	1.3350	1.3495	-61,075	Oct-05	1.3350	1.3495	-67,687	Oct-05	1.3350	1.3495	-80,446
Nov-05	1.3495	1.3585	-57,472	Nov-05	1.3495	1.3585	-64,284	Nov-05	1.3495	1.3585	-77,182
Dec-05	1.3585	1.3495	-13,549	Dec-05	1.3585	1.3495	-20,487	Dec-05	1.3585	1.3495	-24,970
Jan-06	1.3495	1.3250	50,999	Jan-06	1.3495	1.3250	44,187	Jan-06	1.3495	1.3250	55,790
Feb-06	1.3250	1.3075	14,524	Feb-06	1.3250	1.3075	8,049	Feb-06	1.3250	1.3075	10,386
Mar-06	1.3075	1.3435	-81,897	Mar-06	1.3075	1.3435	-88,136	Mar-06	1.3075	1.3435	-100,631
Apr-06	1.3435	1.3205	33,584	Apr-06	1.3435	1.3205	6,904	Apr-06	1.3435	1.3205	34,097
May-06	1.3205	1.5400	464,826	May-06	1.3205	1.5400	698,419	May-06	1.3205	1.5400	685,804
Jun-06	1.5400	1.5455	-64,120	Jun-06	1.5400	1.5455	-73,768	Jun-06	1.5400	1.5455	-88,486
Jul-06	1.5455	1.5000	101,638	Jul-06	1.5455	1.5000	91949	Jul-06	1.5455	1.5000	117231
Aug-06	1.5000	1.4616	104,573	Aug-06	1.5000	1.4616	95372	Aug-06	1.5000	1.4616	121036
Sep-06	1.4616	1.4955	-88,087	Sep-06	1.4616	1.4955	-96498	Sep-06	1.4616	1.4955	-110425
Oct-06	1.4955	1.4550	106,924	Oct-06	1.4955	1.4550	97,972	Oct-06	1.4955	1.4550	124,180
Nov-06	1.4550	1.4522	-32,526	Nov-06	1.4550	1.4522	-40,862	Nov-06	1.4550	1.4522	-49,768
Dec-06	1.4522	1.4150	96,518	Dec-06	1.4522	1.4150	88,224	Dec-06	1.4522	1.4150	111,491
Jan-07	1.4150	1.4033	9,958	Jan-07	1.4150	1.4033	-17,786	Jan-07	1.4150	1.4033	-21,358
Feb-07	1.4033	1.4242	-70,930	Feb-07	1.4033	1.4242	-78,517	Feb-07	1.4033	1.4242	-91,928
Mar-07	1.4242	1.3885	86,324	Mar-07	1.4242	1.3885	78,445	Mar-07	1.4242	1.3885	99,034

Table 9

Summary of back testing results for option strategies

	Rabbit	**Duck**	**Deer**
Total Profit (TRY)	524.300	551.579	589.640
Profitable Months	12	11	11
Average Loss (TRY)	-26.983	-30.983	-36.579
Average Profit	97.454	117.720	133.388

The Rabbit is profitable during 12 months; The Duck and The Deer are profitable during 11 months. Thus, it is suggested that the investor should take position for more than one month.

3.6. Evaluation of Results and Suggestions About Implementation

In the Figure 24, classic option strategy of straddle and risky strategy, the Deer, is compared. The straddle requires buying a call and a put at the same strike (For example, 1.40). As explained above, the Deer requires long and short positions in both calls and puts at different strikes with different weights. The graph is formed in a way that both strategies require the same cost (120.134 TRY). In case of straddle, the investor makes a profit when the parity is below 1.355or above 1.445. Thus, the straddle strategy gives the same probability to TRY appreciation vis-à-vis USD and to TRY depreciation vis-à-vis to USD. From past market data, it is obvious that when TRY appreciates against USD, it appreciates less compared to its depreciation against USD. The Deer option strategy is built on this market observation. Another characteristic of the Deer is that, when TRY depreciates enormously, the profit of the investor outperforms the return of the straddle. To sum up, the Deer option strategy captures the asymmetric behavior of TRY/USD parity more correctly than does the straddle.

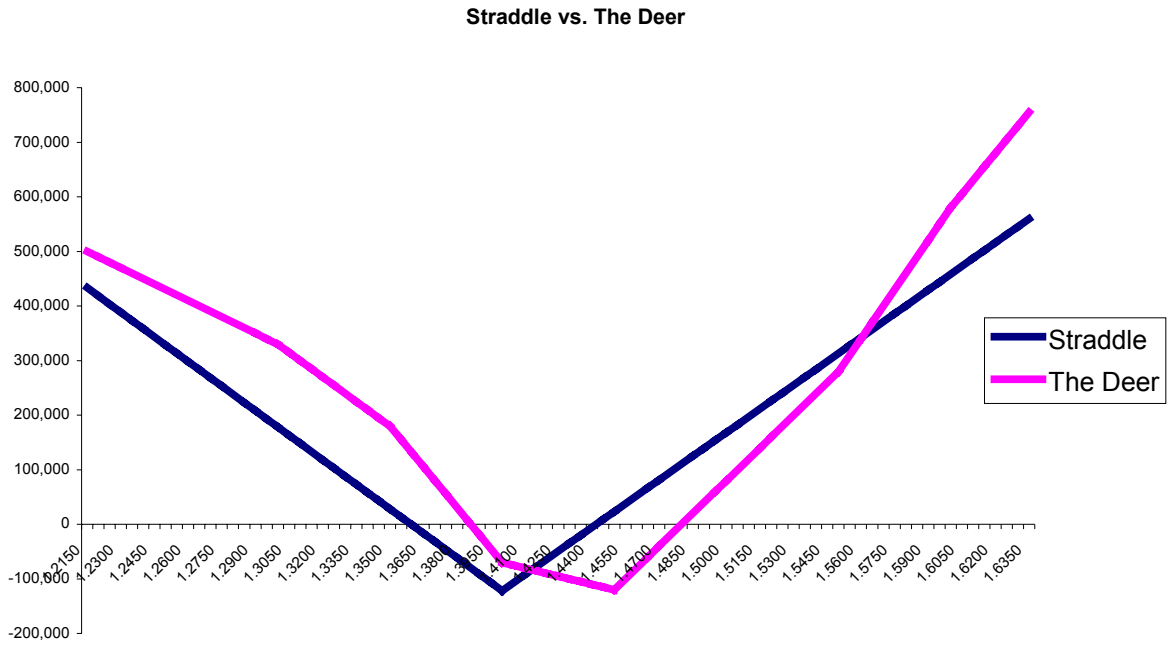

Figure 24: Straddle vs. The Deer

As stated earlier, options are not traded yet on TURKDEX. Some intermediary institutions are active in option writing in Over – the – Counter market. For the time being, Turkish intermediary institutions cannot market the new products based on options due to the Capital Markets Board regulations. However, they can solve the problem via Foreign Offices.

The strategies are designed for knowledgeable and risk- seeking investors and high net worth individuals. Each strategy is designed for different risk profiles. For example, the Rabbit is for relatively risk averse and the Deer are for relatively risk prone investors.

The strategy tests were mainly based on Black Scholes pricing model. It is a fact that due to volatility smile, extreme strikes are not properly priced by Black Scholes model. To solve this problem, different volatilities were used for extreme strikes. Based on the back testing data, the investor may be recommended to take position for not only one month but for 3 consecutive months.

The last improvement area is taxation, as taxes were not taken into account for simplification purposes in this study.

The main difficulty was the Turkish investors' conservative approach towards the risky investment choices. It is aimed to come up with a strategy, which will suit investors' risk perspective by supporting with back testing and information about the exchange rate markets. Like in all other countries, "high return - high risk" strategy could be appreciated by some of Turkish investors, that is the reason to present multiple strategy options depending on market people's risk taking behavior.

In the implementation stage of the strategy, due to the existing regulations, intermediary institutions in Turkey may face some problems however; using foreign offices can solve this problem.

4. CONCLUSION

The financial derivatives are one of main tools of international finance markets and economy that are used as regulator, stabilizer, hedger, and risk fixer. And the developed countries have been using these tools that provides to deepen economy. In Turkey the forward contracts have been used as a Bank operation and Future contracts has become a financial tool for Turkish market with the beginning of TURKDEX in 2005. Although at the options market some of Turkish banks using options of the foreign financial intermediaries in some of products "Protected Currency Account" or "Protected ISE Account" is seemed, legally financial institutions still cannot write options in Turkish Markets.

The options became meaningful to the people for the first time after the studies of Fischer Black, Myron Scholes, and Robert Merton a major breakthrough in the pricing of stock options in the early 1970s. With this academic improvement, the investors could understand options better and these academicians have become best known in option pricing. Although there are many studies and critics for these papers, Black & Scholes Model still keeps its seat and all well-known financial institutions have been using that formula in options pricing.

This paper has examined an options strategy with the support of back testing for a recent twenty – four months. It is seen that there is an opportunity in volatile periods due to correlation between options and volatility in Turkish financial markets and it should be evaluated. The period of study is April 2005 – March 2007 that multi position has taken month - by - month with different levels of weights. The strategy diversifications allow people to risk and to earn in different levels, also.

For an options market in Turkey the financial intermediaries should lobby and take positions that first comer may be critical in the future. The Turkish financial markets should benefit the advantages of internationally accepted financials tools as an open and liberal economy. The academicians can test or develop financial strategies for

local market and improve this paper. The optimum weight of options hold is a point that would be developed in the following studies, also.

APPENDIX

Indicative Exchange Rates Announced By The Central Bank Of Turkey

(Between 05.04.2004 – 06.04.2007)

	Exchange Rates		Exchange Rates on Banknotes		
Date	**Buying**	**Selling**	**Buying**	**Selling**	**LN**
05.04.2004	1,31	1,3185	1,308	1,315	
06.04.2004	1,314	1,3265	1,305	1,32	0,003795
07.04.2004	1,321	1,327	1,3165	1,325	0,003781
08.04.2004	1,328	1,35	1,327	1,338	0,009764
09.04.2004	1,337	1,339	1,325	1,333	-0,00374
12.04.2004	1,333	1,36	1,331	1,356	0,017107
13.04.2004	1,355	1,37	1,349	1,365	0,006615
14.04.2004	1,368	1,376	1,34	1,362	-0,0022
15.04.2004	1,362	1,384	1,353	1,3665	0,003299
16.04.2004	1,37	1,37	1,352	1,3555	-0,00808
19.04.2004	1,35	1,3575	1,34	1,3555	0
20.04.2004	1,354	1,3775	1,35	1,3775	0,0161
21.04.2004	1,377	1,3942	1,372	1,381	0,002538
22.04.2004	1,381	1,3945	1,379	1,3825	0,001086
23.04.2004	1,375	1,383	1,375	1,3795	-0,00217
26.04.2004	1,379	1,396	1,3675	1,394	0,010456
27.04.2004	1,393	1,435	1,38	1,4125	0,013184
28.04.2004	1,414	1,4305	1,402	1,427	0,010213
29.04.2004	1,43	1,454	1,422	1,4295	0,00175
30.04.2004	1,428	1,44	1,4145	1,417	-0,00878
03.05.2004	1,416	1,463	1,41	1,452	0,0244
04.05.2004	1,454	1,4745	1,4395	1,4505	-0,00103
05.05.2004	1,446	1,4585	1,4305	1,439	-0,00796
06.05.2004	1,437	1,48	1,43	1,4795	0,027756
07.05.2004	1,482	1,516	1,469	1,515	0,023711
10.05.2004	1,518	1,558	1,513	1,546	0,020256
11.05.2004	1,55	1,573	1,52	1,5295	-0,01073
12.05.2004	1,5325	1,545	1,504	1,538	0,005542
13.05.2004	1,545	1,565	1,5315	1,535	-0,00195
14.05.2004	1,535	1,541	1,515	1,5275	-0,0049
17.05.2004	1,528	1,5515	1,512	1,5505	0,014945
18.05.2004	1,552	1,563	1,542	1,5555	0,00322
19.05.2004	1,555	1,556	1,54	1,542	-0,00872

20.05.2004	1,549	1,564	1,544	1,554	0,007752
21.05.2004	1,5515	1,561	1,543	1,545	-0,00581
24.05.2004	1,546	1,546	1,5175	1,5345	-0,00682
25.05.2004	1,535	1,535	1,5095	1,5205	-0,00917
26.05.2004	1,523	1,525	1,495	1,502	-0,01224
27.05.2004	1,505	1,528	1,49	1,49	-0,00802
28.05.2004	1,49	1,504	1,481	1,4985	0,005688
31.05.2004	1,5	1,505	1,484	1,487	-0,0077
01.06.2004	1,48	1,516	1,474	1,5085	0,014355
02.06.2004	1,511	1,524	1,506	1,507	-0,00099
03.06.2004	1,51	1,529	1,499	1,5075	0,000332
04.06.2004	1,503	1,5085	1,487	1,4915	-0,01067
07.06.2004	1,49	1,4905	1,469	1,4775	-0,00943
08.06.2004	1,473	1,492	1,459	1,483	0,003716
09.06.2004	1,48	1,4985	1,472	1,498	0,010064
10.06.2004	1,497	1,502	1,481	1,481	-0,01141
11.06.2004	1,483	1,499	1,482	1,498	0,011413
14.06.2004	1,4965	1,514	1,4965	1,5005	0,001668
15.06.2004	1,5015	1,516	1,49	1,4905	-0,00669
16.06.2004	1,492	1,5	1,4815	1,4975	0,004685
17.06.2004	1,494	1,4975	1,4865	1,492	-0,00368
18.06.2004	1,49	1,4985	1,48	1,487	-0,00336
21.06.2004	1,483	1,494	1,479	1,4855	-0,00101
22.06.2004	1,486	1,49	1,479	1,487	0,001009
23.06.2004	1,486	1,493	1,483	1,492	0,003357
24.06.2004	1,49	1,498	1,481	1,49	-0,00134
25.06.2004	1,487	1,4935	1,485	1,489	-0,00067
28.06.2004	1,489	1,495	1,482	1,49	0,000671
29.06.2004	1,489	1,494	1,486	1,49	0
30.06.2004	1,492	1,492	1,4795	1,4825	-0,00505
01.07.2004	1,478	1,479	1,462	1,4665	-0,01085
02.07.2004	1,468	1,47	1,441	1,445	-0,01477
05.07.2004	1,443	1,445	1,433	1,441	-0,00277
06.07.2004	1,441	1,442	1,43	1,441	0
07.07.2004	1,439	1,454	1,435	1,437	-0,00278
08.07.2004	1,439	1,447	1,436	1,438	0,000696
09.07.2004	1,438	1,4515	1,437	1,4425	0,003124
12.07.2004	1,445	1,4505	1,435	1,439	-0,00243
13.07.2004	1,438	1,4415	1,429	1,433	-0,00418
14.07.2004	1,434	1,4365	1,424	1,43	-0,0021
15.07.2004	1,431	1,4385	1,427	1,437	0,004883
16.07.2004	1,436	1,441	1,42	1,426	-0,00768
19.07.2004	1,428	1,433	1,42	1,428	0,001402
20.07.2004	1,43	1,447	1,427	1,442	0,009756
21.07.2004	1,445	1,472	1,4435	1,4685	0,01821

22.07.2004	1,466	1,471	1,455	1,4575	-0,00752
23.07.2004	1,458	1,467	1,45	1,4655	0,005474
26.07.2004	1,466	1,4875	1,4625	1,4835	0,012208
27.07.2004	1,487	1,498	1,483	1,4925	0,006048
28.07.2004	1,492	1,4996	1,475	1,482	-0,00706
29.07.2004	1,485	1,485	1,4665	1,4715	-0,00711
30.07.2004	1,473	1,4755	1,459	1,4655	-0,00409
02.08.2004	1,46	1,47	1,45	1,468	0,001704
03.08.2004	1,468	1,477	1,462	1,464	-0,00273
04.08.2004	1,464	1,4875	1,46	1,4785	0,009856
05.08.2004	1,476	1,477	1,4635	1,4635	-0,0102
06.08.2004	1,468	1,473	1,44	1,44	-0,01619
09.08.2004	1,445	1,4525	1,438	1,4515	0,007954
10.08.2004	1,453	1,46	1,442	1,4475	-0,00276
11.08.2004	1,449	1,465	1,449	1,4615	0,009625
12.08.2004	1,46	1,473	1,4515	1,466	0,003074
13.08.2004	1,462	1,4825	1,458	1,461	-0,00342
16.08.2004	1,461	1,4635	1,45	1,461	0
17.08.2004	1,462	1,462	1,444	1,4495	-0,0079
18.08.2004	1,45	1,47	1,4485	1,465	0,010637
19.08.2004	1,465	1,473	1,458	1,47	0,003407
20.08.2004	1,468	1,482	1,4645	1,4755	0,003735
23.08.2004	1,478	1,514	1,476	1,512	0,024436
24.08.2004	1,513	1,53	1,5	1,502	-0,00664
25.08.2004	1,508	1,513	1,489	1,506	0,00266
26.08.2004	1,51	1,516	1,5005	1,508	0,001327
27.08.2004	1,509	1,519	1,496	1,512	0,002649
30.08.2004	1,513	1,515	1,5105	1,5125	0,000331
31.08.2004	1,515	1,52	1,497	1,4995	-0,00863
01.09.2004	1,498	1,5075	1,491	1,503	0,002331
02.09.2004	1,504	1,513	1,5	1,5085	0,003653
03.09.2004	1,506	1,511	1,5015	1,507	-0,00099
06.09.2004	1,504	1,515	1,5035	1,508	0,000663
07.09.2004	1,506	1,509	1,4975	1,5015	-0,00432
08.09.2004	1,503	1,506	1,49	1,49	-0,00769
09.09.2004	1,494	1,501	1,482	1,485	-0,00336
10.09.2004	1,487	1,495	1,483	1,493	0,005373
13.09.2004	1,49	1,504	1,49	1,4995	0,004344
14.09.2004	1,5	1,507	1,49	1,495	-0,00301
15.09.2004	1,4925	1,498	1,487	1,4975	0,001671
16.09.2004	1,497	1,512	1,493	1,496	-0,001
17.09.2004	1,51	1,527	1,502	1,5185	0,014928
20.09.2004	1,525	1,547	1,519	1,524	0,003615
21.09.2004	1,53	1,54	1,508	1,5105	-0,0089
22.09.2004	1,509	1,514	1,502	1,5105	0

23.09.2004	1,511	1,511	1,486	1,491	-0,01299
24.09.2004	1,494	1,501	1,484	1,492	0,00067
27.09.2004	1,498	1,5	1,489	1,495	0,002009
28.09.2004	1,496	1,506	1,4925	1,502	0,004671
29.09.2004	1,5	1,507	1,499	1,503	0,000666
30.09.2004	1,499	1,507	1,495	1,5005	-0,00166
01.10.2004	1,5	1,51	1,499	1,506	0,003659
04.10.2004	1,5048	1,512	1,504	1,5105	0,002984
05.10.2004	1,509	1,511	1,5	1,5025	-0,00531
06.10.2004	1,505	1,51	1,495	1,502	-0,00033
07.10.2004	1,503	1,505	1,495	1,4985	-0,00233
08.10.2004	1,501	1,501	1,487	1,4905	-0,00535
11.10.2004	1,491	1,4955	1,489	1,489	-0,00101
12.10.2004	1,49637	1,49738	1,491	1,491	0,001342
13.10.2004	1,492	1,4945	1,4805	1,488	-0,00201
14.10.2004	1,49	1,492	1,483	1,4855	-0,00168
15.10.2004	1,488	1,4931	1,481	1,4855	0
18.10.2004	1,487	1,4885	1,474	1,474	-0,00777
19.10.2004	1,478	1,4805	1,47	1,478	0,00271
20.10.2004	1,478	1,488	1,474	1,4845	0,004388
21.10.2004	1,486	1,487	1,477	1,479	-0,00371
22.10.2004	1,48	1,4825	1,474	1,4785	-0,00034
25.10.2004	1,48	1,481	1,471	1,4755	-0,00203
26.10.2004	1,4765	1,4835	1,475	1,478	0,001693
27.10.2004	1,477	1,4795	1,4715	1,4765	-0,00102
28.10.2004	1,477	1,478	1,469	1,4715	-0,00339
29.10.2004	1,4715	1,477	1,4685	1,4685	-0,00204
01.11.2004	1,471	1,4815	1,4685	1,472	0,002381
02.11.2004	1,47	1,475	1,466	1,468	-0,00272
03.11.2004	1,466	1,4715	1,458	1,4605	-0,00512
04.11.2004	1,4625	1,469	1,458	1,4615	0,000684
05.11.2004	1,462	1,466	1,4505	1,4555	-0,00411
08.11.2004	1,455	1,461	1,45	1,458	0,001716
09.11.2004	1,457	1,4615	1,45075	1,4575	-0,00034
10.11.2004	1,457	1,4655	1,45	1,4565	-0,00069
11.11.2004	1,456	1,46	1,4505	1,456	-0,00034
12.11.2004	1,454	1,462	1,4465	1,4465	-0,00655
15.11.2004	1,447	1,462	1,447	1,457	0,007233
16.11.2004	1,455	1,457	1,4505	1,455	-0,00137
17.11.2004	1,452	1,455	1,443	1,448	-0,00482
18.11.2004	1,445	1,448	1,4375	1,445	-0,00207
19.11.2004	1,448	1,449	1,435	1,437	-0,00555
22.11.2004	1,439	1,4425	1,4355	1,438	0,000696
23.11.2004	1,437	1,4425	1,4304	1,4325	-0,00383
24.11.2004	1,4335	1,434	1,42075	1,4265	-0,0042

25.11.2004	1,427	1,43	1,42	1,424	-0,00175
26.11.2004	1,424	1,4295	1,417	1,42	-0,00281
29.11.2004	1,42	1,437	1,4185	1,429	0,006318
30.11.2004	1,4275	1,44	1,424	1,429	0
01.12.2004	1,43	1,432	1,416	1,419	-0,00702
02.12.2004	1,419	1,421	1,409	1,4155	-0,00247
03.12.2004	1,418	1,425	1,397	1,399	-0,01173
06.12.2004	1,399	1,4015	1,391	1,395	-0,00286
07.12.2004	1,396	1,404	1,39	1,3945	-0,00036
08.12.2004	1,4	1,423	1,394	1,4145	0,01424
09.12.2004	1,4145	1,446	1,409	1,4455	0,021679
10.12.2004	1,445	1,457	1,43	1,43	-0,01078
13.12.2004	1,43	1,433	1,4185	1,421	-0,00631
14.12.2004	1,422	1,4255	1,4115	1,4195	-0,00106
15.12.2004	1,419	1,422	1,4	1,4	-0,01383
16.12.2004	1,4005	1,4135	1,396	1,407	0,004988
17.12.2004	1,412	1,4265	1,3945	1,397	-0,00713
20.12.2004	1,397	1,407	1,38	1,385	-0,00863
21.12.2004	1,385	1,397	1,384	1,3945	0,006836
22.12.2004	1,395	1,407	1,3845	1,39	-0,00323
23.12.2004	1,386	1,389	1,372	1,3735	-0,01194
24.12.2004	1,373	1,376	1,363	1,365	-0,00621
27.12.2004	1,368	1,37	1,346	1,3475	-0,0129
28.12.2004	1,3475	1,351	1,342	1,3475	0
29.12.2004	1,348	1,364	1,3455	1,354	0,004812
30.12.2004	1,354	1,356	1,338	1,3405	-0,01002
31.12.2004	1,34	1,351	1,333	1,345	0,003351
03.01.2005	1,345	1,361	1,3425	1,3425	-0,00186
04.01.2005	1,342	1,365	1,342	1,363	0,015155
05.01.2005	1,3625	1,3965	1,325	1,3745	0,008402
06.01.2005	1,376	1,415	1,3755	1,3925	0,013011
07.01.2005	1,392	1,4	1,36	1,394	0,001077
10.01.2005	1,394	1,41	1,3745	1,392	-0,00144
11.01.2005	1,383	1,3895	1,377	1,377	-0,01083
12.01.2005	1,375	1,382	1,33	1,358	-0,01389
13.01.2005	1,355	1,361	1,3405	1,351	-0,00517
14.01.2005	1,352	1,375	1,345	1,345	-0,00445
17.01.2005	1,349	1,349	1,33	1,335	-0,00746
18.01.2005	1,341	1,3475	1,333	1,34	0,003738
19.01.2005	1,34	1,347	1,3335	1,342	0,001491
20.01.2005	1,34	1,351	1,34	1,349	0,005203
21.01.2005	1,345	1,348	1,3375	1,3375	-0,00856
24.01.2005	1,34	1,342	1,3335	1,336	-0,00112
25.01.2005	1,336	1,339	1,326	1,332	-0,003
26.01.2005	1,333	1,3365	1,316	1,32	-0,00905

27.01.2005	1,319	1,3498	1,3145	1,335	0,0113
28.01.2005	1,336	1,3395	1,327	1,336	0,000749
31.01.2005	1,335	1,343	1,327	1,333	-0,00225
01.02.2005	1,335	1,336	1,324	1,3275	-0,00413
02.02.2005	1,326	1,338	1,3195	1,325	-0,00189
03.02.2005	1,326	1,3277	1,315	1,3209	-0,0031
04.02.2005	1,319	1,3224	1,305	1,311	-0,00752
07.02.2005	1,315	1,3215	1,308	1,317	0,004566
08.02.2005	1,3185	1,3364	1,313	1,33	0,009823
09.02.2005	1,331	1,347	1,3185	1,33	0
10.02.2005	1,33	1,344	1,324	1,327	-0,00226
11.02.2005	1,326	1,328	1,3155	1,318	-0,00681
14.02.2005	1,3165	1,317	1,3085	1,3115	-0,00494
15.02.2005	1,311	1,315	1,3035	1,31	-0,00114
16.02.2005	1,311	1,321	1,305	1,314	0,003049
17.02.2005	1,311	1,316	1,3015	1,3035	-0,00802
18.02.2005	1,3035	1,313	1,301	1,309	0,004211
21.02.2005	1,305	1,309	1,3	1,305	-0,00306
22.02.2005	1,301	1,305	1,2915	1,297	-0,00615
23.02.2005	1,297	1,3066	1,295	1,301	0,003079
24.02.2005	1,299	1,302	1,288	1,295	-0,00462
25.02.2005	1,296	1,3	1,2875	1,29	-0,00387
28.02.2005	1,29	1,2915	1,274	1,2805	-0,00739
01.03.2005	1,2785	1,286	1,2745	1,279	-0,00117
02.03.2005	1,279	1,2865	1,275	1,28	0,000782
03.03.2005	1,281	1,283	1,2665	1,28	0
04.03.2005	1,278	1,28	1,253	1,255	-0,01972
07.03.2005	1,2545	1,263	1,252	1,2575	0,00199
08.03.2005	1,259	1,267	1,255	1,264	0,005156
09.03.2005	1,259	1,2775	1,2465	1,265	0,000791
10.03.2005	1,263	1,29	1,2585	1,275	0,007874
11.03.2005	1,276	1,2775	1,256	1,275	0
14.03.2005	1,264	1,2978	1,264	1,293	0,014019
15.03.2005	1,293	1,312	1,285	1,312	0,014588
16.03.2005	1,312	1,336	1,308	1,316	0,003044
17.03.2005	1,316	1,341	1,304	1,31	-0,00457
18.03.2005	1,313	1,323	1,302	1,31	0
21.03.2005	1,308	1,3445	1,308	1,3325	0,01703
22.03.2005	1,34	1,344	1,323	1,3325	0
23.03.2005	1,365	1,373	1,349	1,362	0,021897
24.03.2005	1,362	1,365	1,343	1,355	-0,00515
25.03.2005	1,359	1,3595	1,345	1,352	-0,00222
28.03.2005	1,351	1,385	1,351	1,38	0,020499
29.03.2005	1,378	1,397	1,37	1,39	0,00722
30.03.2005	1,385	1,385	1,3585	1,361	-0,02108

31.03.2005	1,359	1,36	1,335	1,3505	-0,00774
01.04.2005	1,3495	1,358	1,33	1,3535	0,002219
04.04.2005	1,351	1,3705	1,349	1,3655	0,008827
05.04.2005	1,365	1,377	1,353	1,359	-0,00477
06.04.2005	1,358	1,358	1,34	1,352	-0,00516
07.04.2005	1,352	1,352	1,334	1,3435	-0,00631
08.04.2005	1,345	1,356	1,345	1,346	0,001859
11.04.2005	1,344	1,355	1,337	1,344	-0,00149
12.04.2005	1,342	1,3572	1,337	1,345	0,000744
13.04.2005	1,342	1,3456	1,334	1,341	-0,00298
14.04.2005	1,3405	1,375	1,34	1,3645	0,017372
15.04.2005	1,365	1,385	1,3635	1,364	-0,00037
18.04.2005	1,3665	1,3835	1,3665	1,369	0,003659
19.04.2005	1,369	1,377	1,361	1,361	-0,00586
20.04.2005	1,361	1,3655	1,3525	1,3555	-0,00405
21.04.2005	1,358	1,368	1,353	1,363	0,005518
22.04.2005	1,361	1,362	1,35	1,354	-0,00662
25.04.2005	1,358	1,366	1,3545	1,363	0,006625
26.04.2005	1,36	1,3651	1,3555	1,36	-0,0022
27.04.2005	1,362	1,375	1,3595	1,374	0,010241
28.04.2005	1,371	1,4085	1,3685	1,405	0,022311
29.04.2005	1,399	1,4055	1,38	1,389	-0,01145
02.05.2005	1,394	1,395	1,377	1,381	-0,00578
03.05.2005	1,383	1,383	1,36	1,36	-0,01532
04.05.2005	1,357	1,357	1,342	1,35	-0,00738
05.05.2005	1,345	1,349	1,333	1,34	-0,00743
06.05.2005	1,347	1,355	1,3375	1,348	0,005952
09.05.2005	1,353	1,363	1,35	1,3565	0,006286
10.05.2005	1,3565	1,375	1,3495	1,368	0,008442
11.05.2005	1,367	1,376	1,363	1,3655	-0,00183
12.05.2005	1,363	1,372	1,35	1,3625	-0,0022
13.05.2005	1,367	1,373	1,36	1,371	0,006219
16.05.2005	1,37	1,388	1,37	1,379	0,005818
17.05.2005	1,379	1,3845	1,371	1,375	-0,0029
18.05.2005	1,378	1,379	1,36	1,362	-0,0095
19.05.2005	1,365	1,37	1,362	1,362	0
20.05.2005	1,363	1,38	1,356	1,375	0,0095
23.05.2005	1,376	1,3925	1,3745	1,382	0,005078
24.05.2005	1,386	1,391	1,3745	1,39	0,005772
25.05.2005	1,387	1,394	1,38	1,384	-0,00433
26.05.2005	1,386	1,3905	1,3745	1,3835	-0,00036
27.05.2005	1,382	1,383	1,362	1,368	-0,01127
30.05.2005	1,373	1,377	1,362	1,362	-0,0044
31.05.2005	1,369	1,373	1,3485	1,362	0
01.06.2005	1,36	1,3695	1,35	1,358	-0,00294

02.06.2005	1,358	1,362	1,339	1,344	-0,01036
03.06.2005	1,3415	1,365	1,334	1,364	0,014771
06.06.2005	1,362	1,376	1,359	1,364	0
07.06.2005	1,363	1,369	1,3525	1,369	0,003659
08.06.2005	1,364	1,3725	1,355	1,358	-0,00807
09.06.2005	1,36	1,368	1,354	1,36	0,001472
10.06.2005	1,3615	1,368	1,353	1,364	0,002937
13.06.2005	1,365	1,3815	1,365	1,3755	0,008396
14.06.2005	1,3765	1,383	1,361	1,382	0,004714
15.06.2005	1,38	1,383	1,3685	1,372	-0,00726
16.06.2005	1,372	1,374	1,359	1,36	-0,00878
17.06.2005	1,362	1,362	1,35	1,353	-0,00516
20.06.2005	1,357	1,365	1,352	1,36	0,00516
21.06.2005	1,3615	1,367	1,351	1,356	-0,00295
22.06.2005	1,352	1,358	1,348	1,352	-0,00295
23.06.2005	1,351	1,359	1,3465	1,353	0,000739
24.06.2005	1,3501	1,356	1,345	1,347	-0,00444
27.06.2005	1,347	1,354	1,343	1,3485	0,001113
28.06.2005	1,35	1,352	1,342	1,344	-0,00334
29.06.2005	1,347	1,35	1,3375	1,3385	-0,0041
30.06.2005	1,338	1,343	1,327	1,328	-0,00788
01.07.2005	1,329	1,339	1,329	1,333	0,003758
04.07.2005	1,338	1,344	1,3355	1,3385	0,004118
05.07.2005	1,341	1,351	1,339	1,345	0,004844
06.07.2005	1,345	1,3515	1,3405	1,3475	0,001857
07.07.2005	1,348	1,3735	1,345	1,355	0,00555
08.07.2005	1,351	1,356	1,3365	1,342	-0,00964
11.07.2005	1,341	1,3455	1,335	1,338	-0,00299
12.07.2005	1,335	1,3401	1,3245	1,3245	-0,01014
13.07.2005	1,326	1,3355	1,325	1,332	0,005647
14.07.2005	1,333	1,3405	1,324	1,3275	-0,00338
15.07.2005	1,326	1,334	1,3235	1,329	0,001129
18.07.2005	1,331	1,335	1,327	1,331	0,001504
19.07.2005	1,331	1,336	1,328	1,332	0,000751
20.07.2005	1,329	1,3355	1,3265	1,327	-0,00376
21.07.2005	1,3255	1,3293	1,319	1,321	-0,00453
22.07.2005	1,322	1,3466	1,3165	1,337	0,012039
25.07.2005	1,337	1,342	1,3325	1,335	-0,0015
26.07.2005	1,3385	1,354	1,3345	1,343	0,005975
27.07.2005	1,343	1,345	1,3355	1,337	-0,00448
28.07.2005	1,337	1,341	1,324	1,325	-0,00902
29.07.2005	1,325	1,3302	1,3195	1,3234	-0,00121
01.08.2005	1,322	1,324	1,315	1,319	-0,00333
02.08.2005	1,318	1,3264	1,3155	1,32	0,000758
03.08.2005	1,321	1,323	1,3085	1,3105	-0,00722

04.08.2005	1,311	1,318	1,307	1,31	-0,00038
05.08.2005	1,3115	1,3195	1,3075	1,3145	0,003429
08.08.2005	1,3145	1,3234	1,312	1,322	0,005689
09.08.2005	1,322	1,327	1,317	1,324	0,001512
10.08.2005	1,323	1,323	1,312	1,321	-0,00227
11.08.2005	1,319	1,3325	1,3145	1,328	0,005285
12.08.2005	1,329	1,3526	1,325	1,347	0,014206
15.08.2005	1,348	1,366	1,3405	1,343	-0,00297
16.08.2005	1,343	1,353	1,3385	1,347	0,002974
17.08.2005	1,346	1,374	1,346	1,368	0,01547
18.08.2005	1,366	1,373	1,358	1,368	0
19.08.2005	1,3715	1,3802	1,3645	1,379	0,008009
22.08.2005	1,377	1,377	1,357	1,359	-0,01461
23.08.2005	1,358	1,37	1,351	1,365	0,004405
24.08.2005	1,363	1,376	1,359	1,3655	0,000366
25.08.2005	1,371	1,3785	1,36	1,365	-0,00037
26.08.2005	1,358	1,363	1,3505	1,356	-0,00662
29.08.2005	1,354	1,3595	1,351	1,357	0,000737
30.08.2005	1,355	1,355	1,355	1,355	-0,00147
31.08.2005	1,357	1,362	1,3375	1,3425	-0,00927
01.09.2005	1,337	1,346	1,3325	1,339	-0,00261
02.09.2005	1,34	1,349	1,3295	1,334	-0,00374
05.09.2005	1,332	1,3399	1,326	1,331	-0,00225
06.09.2005	1,33	1,339	1,324	1,3295	-0,00113
07.09.2005	1,328	1,337	1,3245	1,333	0,002629
08.09.2005	1,333	1,3387	1,327	1,3325	-0,00038
09.09.2005	1,331	1,336	1,325	1,334	0,001125
12.09.2005	1,335	1,34	1,3295	1,337	0,002246
13.09.2005	1,335	1,347	1,329	1,342	0,003733
14.09.2005	1,341	1,35	1,332	1,34	-0,00149
15.09.2005	1,342	1,3471	1,3335	1,3375	-0,00187
16.09.2005	1,3375	1,344	1,331	1,3405	0,00224
19.09.2005	1,34	1,352	1,3385	1,3435	0,002235
20.09.2005	1,3375	1,354	1,333	1,342	-0,00112
21.09.2005	1,339	1,351	1,333	1,351	0,006684
22.09.2005	1,332	1,346	1,33	1,3395	-0,00855
23.09.2005	1,34	1,357	1,336	1,3465	0,005212
26.09.2005	1,344	1,352	1,341	1,3465	0
27.09.2005	1,3465	1,353	1,3375	1,353	0,004816
28.09.2005	1,3445	1,356	1,342	1,348	-0,0037
29.09.2005	1,345	1,353	1,34	1,348	0
30.09.2005	1,347	1,3531	1,3395	1,344	-0,00297
03.10.2005	1,3525	1,372	1,334	1,335	-0,00672
04.10.2005	1,333	1,36	1,327	1,351	0,011914
05.10.2005	1,349	1,3585	1,3435	1,35	-0,00074

06.10.2005	1,348	1,366	1,346	1,36	0,00738
07.10.2005	1,357	1,364	1,344	1,345	-0,01109
10.10.2005	1,3425	1,35	1,337	1,348	0,002228
11.10.2005	1,3485	1,354	1,3405	1,3475	-0,00037
12.10.2005	1,346	1,3615	1,345	1,359	0,008498
13.10.2005	1,36	1,3747	1,355	1,366	0,005138
14.10.2005	1,366	1,3746	1,3615	1,368	0,001463
17.10.2005	1,363	1,3653	1,3525	1,36	-0,00587
18.10.2005	1,36	1,369	1,356	1,368	0,005865
19.10.2005	1,363	1,376	1,362	1,368	0
20.10.2005	1,369	1,369	1,3565	1,366	-0,00146
21.10.2005	1,365	1,3705	1,355	1,361	-0,00367
24.10.2005	1,362	1,366	1,356	1,36	-0,00074
25.10.2005	1,358	1,364	1,35	1,351	-0,00664
26.10.2005	1,358	1,359	1,347	1,3545	0,002587
27.10.2005	1,353	1,3575	1,346	1,35	-0,00333
28.10.2005	1,348	1,353	1,344	1,35	0
31.10.2005	1,35	1,352	1,341	1,35	0
01.11.2005	1,35	1,3535	1,343	1,3495	-0,00037
02.11.2005	1,345	1,3505	1,343	1,3453	-0,00312
03.11.2005	1,345	1,351	1,3435	1,3475	0,001634
04.11.2005	1,348	1,36	1,348	1,359	0,008498
07.11.2005	1,359	1,364	1,354	1,358	-0,00074
08.11.2005	1,358	1,3685	1,356	1,3595	0,001104
09.11.2005	1,3595	1,3645	1,353	1,3588	-0,00052
10.11.2005	1,3588	1,3665	1,3575	1,363	0,003086
11.11.2005	1,363	1,3663	1,3585	1,3612	-0,00132
14.11.2005	1,359	1,367	1,3545	1,363	0,001321
15.11.2005	1,362	1,365	1,353	1,356	-0,00515
16.11.2005	1,356	1,3615	1,352	1,356	0
17.11.2005	1,359	1,361	1,349	1,349	-0,00518
18.11.2005	1,3535	1,3736	1,351	1,365	0,011791
21.11.2005	1,363	1,368	1,3585	1,364	-0,00073
22.11.2005	1,363	1,3708	1,3615	1,363	-0,00073
23.11.2005	1,363	1,363	1,3535	1,3565	-0,00478
24.11.2005	1,356	1,361	1,3525	1,3525	-0,00295
25.11.2005	1,355	1,3595	1,352	1,3565	0,002953
28.11.2005	1,356	1,363	1,3535	1,3535	-0,00221
29.11.2005	1,3535	1,3575	1,35	1,3565	0,002214
30.11.2005	1,3565	1,3582	1,3505	1,355	-0,00111
01.12.2005	1,355	1,3606	1,3515	1,3585	0,00258
02.12.2005	1,3585	1,3629	1,353	1,3555	-0,00221
05.12.2005	1,357	1,3609	1,3505	1,3527	-0,00207
06.12.2005	1,3527	1,3572	1,349	1,351	-0,00126
07.12.2005	1,351	1,358	1,3495	1,355	0,002956

08.12.2005	1,355	1,3585	1,3495	1,354	-0,00074
09.12.2005	1,3545	1,358	1,35	1,3575	0,002582
12.12.2005	1,353	1,357	1,345	1,348	-0,00702
13.12.2005	1,3475	1,3493	1,3425	1,345	-0,00223
14.12.2005	1,3455	1,3465	1,3375	1,3455	0,000372
15.12.2005	1,3455	1,35	1,34	1,348	0,001856
16.12.2005	1,3475	1,353	1,344	1,348	0
19.12.2005	1,348	1,3512	1,3435	1,35	0,001483
20.12.2005	1,35	1,3515	1,3445	1,35	0
21.12.2005	1,35	1,3555	1,345	1,35	0
22.12.2005	1,351	1,3543	1,3455	1,35	0
23.12.2005	1,349	1,3513	1,3445	1,3495	-0,00037
26.12.2005	1,347	1,349	1,344	1,346	-0,0026
27.12.2005	1,347	1,3508	1,3438	1,349	0,002226
28.12.2005	1,347	1,35	1,344	1,3482	-0,00059
29.12.2005	1,347	1,3508	1,344	1,348	-0,00015
30.12.2005	1,3465	1,3521	1,3425	1,35	0,001483
02.01.2006	1,349	1,351	1,345	1,3495	-0,00037
03.01.2006	1,348	1,3506	1,34	1,342	-0,00557
04.01.2006	1,339	1,3405	1,3305	1,3328	-0,00688
05.01.2006	1,3335	1,3384	1,33	1,3325	-0,00023
06.01.2006	1,334	1,3378	1,3245	1,328	-0,00338
09.01.2006	1,329	1,3395	1,327	1,336	0,006006
10.01.2006	1,334	1,355	1,334	1,3435	0,005598
11.01.2006	1,3435	1,3435	1,3338	1,3338	-0,00725
12.01.2006	1,3338	1,3386	1,3335	1,3375	0,00277
13.01.2006	1,3355	1,3421	1,3355	1,3365	-0,00075
16.01.2006	1,334	1,3365	1,3265	1,3293	-0,0054
17.01.2006	1,33	1,341	1,3265	1,3355	0,004653
18.01.2006	1,337	1,3392	1,329	1,3365	0,000749
19.01.2006	1,335	1,3391	1,33	1,3345	-0,0015
20.01.2006	1,335	1,338	1,33	1,335	0,000375
23.01.2006	1,3285	1,3312	1,3185	1,3245	-0,0079
24.01.2006	1,3245	1,3247	1,3175	1,323	-0,00113
25.01.2006	1,323	1,325	1,316	1,321	-0,00151
26.01.2006	1,323	1,3252	1,318	1,321	0
27.01.2006	1,323	1,327	1,3175	1,323	0,001513
30.01.2006	1,327	1,3295	1,3225	1,3265	0,002642
31.01.2006	1,323	1,328	1,319	1,3215	-0,00378
01.02.2006	1,323	1,326	1,318	1,325	0,002645
02.02.2006	1,323	1,331	1,3215	1,3245	-0,00038
03.02.2006	1,323	1,3295	1,3195	1,3265	0,001509
06.02.2006	1,328	1,3317	1,323	1,3275	0,000754
07.02.2006	1,329	1,3315	1,323	1,33	0,001881
08.02.2006	1,33	1,3357	1,3275	1,33	0

09.02.2006	1,33	1,3325	1,325	1,33	0
10.02.2006	1,33	1,3305	1,3195	1,33	0
13.02.2006	1,3295	1,3322	1,324	1,326	-0,00301
14.02.2006	1,3295	1,3295	1,3222	1,3265	0,000377
15.02.2006	1,326	1,3415	1,322	1,3335	0,005263
16.02.2006	1,333	1,3348	1,3243	1,3275	-0,00451
17.02.2006	1,327	1,33	1,317	1,3195	-0,00604
20.02.2006	1,3195	1,32	1,3085	1,3155	-0,00304
21.02.2006	1,3175	1,319	1,312	1,3167	0,000912
22.02.2006	1,3177	1,335	1,3167	1,323	0,004773
23.02.2006	1,324	1,3251	1,313	1,3208	-0,00166
24.02.2006	1,3167	1,3224	1,315	1,32	-0,00061
27.02.2006	1,3167	1,3215	1,3105	1,3127	-0,00555
28.02.2006	1,314	1,3162	1,3065	1,313	0,000229
01.03.2006	1,3167	1,3167	1,3008	1,3075	-0,0042
02.03.2006	1,307	1,307	1,2965	1,301	-0,00498
03.03.2006	1,301	1,3098	1,2955	1,306	0,003836
06.03.2006	1,305	1,3122	1,2995	1,3122	0,004736
07.03.2006	1,305	1,339	1,305	1,3315	0,014601
08.03.2006	1,328	1,3575	1,3235	1,3558	0,018086
09.03.2006	1,3558	1,3558	1,3345	1,3485	-0,0054
10.03.2006	1,347	1,359	1,3385	1,3435	-0,00371
13.03.2006	1,344	1,3475	1,3335	1,3441	0,000446
14.03.2006	1,341	1,354	1,33	1,3347	-0,00702
15.03.2006	1,337	1,3385	1,3275	1,3326	-0,00157
16.03.2006	1,337	1,337	1,317	1,3175	-0,0114
17.03.2006	1,318	1,3295	1,316	1,3245	0,005299
20.03.2006	1,3247	1,335	1,324	1,3305	0,00452
21.03.2006	1,334	1,3465	1,332	1,3435	0,009723
22.03.2006	1,3455	1,3535	1,338	1,3405	-0,00224
23.03.2006	1,3415	1,3443	1,3315	1,34	-0,00037
24.03.2006	1,344	1,349	1,3363	1,3372	-0,00209
27.03.2006	1,348	1,352	1,3385	1,3505	0,009897
28.03.2006	1,351	1,3575	1,3445	1,352	0,00111
29.03.2006	1,3539	1,3655	1,352	1,3523	0,000222
30.03.2006	1,3535	1,355	1,3425	1,3485	-0,00281
31.03.2006	1,3485	1,352	1,3415	1,3425	-0,00446
03.04.2006	1,343	1,3481	1,3395	1,3435	0,000745
04.04.2006	1,34	1,3416	1,3295	1,3325	-0,00822
05.04.2006	1,334	1,3386	1,33	1,3345	0,0015
06.04.2006	1,335	1,3394	1,332	1,3355	0,000749
07.04.2006	1,3395	1,3395	1,328	1,337	0,001123
10.04.2006	1,338	1,3461	1,338	1,3435	0,00485
11.04.2006	1,3385	1,3443	1,3345	1,3415	-0,00149
12.04.2006	1,3395	1,3455	1,338	1,3435	0,00149

13.04.2006	1,344	1,354	1,339	1,351	0,005567
14.04.2006	1,352	1,354	1,345	1,349	-0,00148
17.04.2006	1,347	1,3505	1,342	1,345	-0,00297
18.04.2006	1,344	1,3461	1,3355	1,336	-0,00671
19.04.2006	1,3295	1,333	1,3255	1,3275	-0,00638
20.04.2006	1,3285	1,3329	1,3255	1,3302	0,002032
21.04.2006	1,329	1,3342	1,3215	1,3235	-0,00505
24.04.2006	1,323	1,3257	1,32	1,3238	0,000227
25.04.2006	1,32	1,326	1,316	1,325	0,000906
26.04.2006	1,3245	1,33	1,3225	1,326	0,000754
27.04.2006	1,323	1,3302	1,319	1,319	-0,00529
28.04.2006	1,32	1,325	1,316	1,3215	0,001894
01.05.2006	1,319	1,3215	1,3145	1,3205	-0,00076
02.05.2006	1,323	1,3261	1,314	1,3165	-0,00303
03.05.2006	1,316	1,3233	1,312	1,3207	0,003185
04.05.2006	1,32	1,3267	1,3155	1,3181	-0,00197
05.05.2006	1,316	1,3212	1,314	1,3171	-0,00076
08.05.2006	1,316	1,3263	1,312	1,3248	0,005829
09.05.2006	1,324	1,3485	1,3235	1,3455	0,015504
10.05.2006	1,342	1,359	1,3385	1,353	0,005559
11.05.2006	1,357	1,3716	1,3515	1,3693	0,011975
12.05.2006	1,368	1,4235	1,368	1,3993	0,021672
15.05.2006	1,4205	1,5335	1,413	1,484	0,058769
16.05.2006	1,484	1,487	1,422	1,448	-0,02456
17.05.2006	1,448	1,487	1,4055	1,4827	0,023681
18.05.2006	1,4827	1,52	1,4715	1,498	0,010266
19.05.2006	1,498	1,498	1,477	1,483	-0,01006
22.05.2006	1,483	1,5475	1,48	1,537	0,035765
23.05.2006	1,537	1,537	1,484	1,5	-0,02437
24.05.2006	1,539	1,565	1,5245	1,554	0,035367
25.05.2006	1,554	1,558	1,522	1,53	-0,01556
26.05.2006	1,53	1,55	1,5	1,528	-0,00131
29.05.2006	1,527	1,536	1,5165	1,53	0,001308
30.05.2006	1,54	1,552	1,529	1,5465	0,010727
31.05.2006	1,5405	1,58	1,5405	1,572	0,016354
01.06.2006	1,568	1,576	1,533	1,54	-0,02057
02.06.2006	1,5405	1,617	1,518	1,607	0,042587
05.06.2006	1,607	1,607	1,569	1,576	-0,01948
06.06.2006	1,585	1,589	1,5445	1,563	-0,00828
07.06.2006	1,559	1,567	1,505	1,516	-0,03053
08.06.2006	1,517	1,562	1,517	1,5538	0,024628
09.06.2006	1,545	1,5495	1,5265	1,539	-0,00957
12.06.2006	1,545	1,57	1,531	1,5635	0,015794
13.06.2006	1,569	1,6225	1,569	1,584	0,013026
14.06.2006	1,59	1,612	1,576	1,5965	0,00786

15.06.2006	1,594	1,6025	1,5775	1,6009	0,002752
16.06.2006	1,607	1,607	1,576	1,583	-0,01124
19.06.2006	1,585	1,611	1,585	1,599	0,010057
20.06.2006	1,602	1,638	1,602	1,635	0,022264
21.06.2006	1,63	1,6753	1,616	1,6637	0,017401
22.06.2006	1,655	1,6995	1,622	1,6835	0,011831
23.06.2006	1,679	1,758	1,673	1,7095	0,015326
26.06.2006	1,698	1,7215	1,645	1,667	-0,02518
27.06.2006	1,67	1,6775	1,624	1,6335	-0,0203
28.06.2006	1,633	1,646	1,6	1,608	-0,01573
29.06.2006	1,607	1,621	1,5875	1,5875	-0,01283
30.06.2006	1,583	1,592	1,56	1,582	-0,00347
03.07.2006	1,583	1,585	1,538	1,5455	-0,02334
04.07.2006	1,549	1,551	1,5295	1,5505	0,00323
05.07.2006	1,547	1,611	1,544	1,5972	0,029675
06.07.2006	1,608	1,615	1,556	1,563	-0,02165
07.07.2006	1,558	1,582	1,536	1,5558	-0,00462
10.07.2006	1,554	1,5655	1,54	1,5471	-0,00561
11.07.2006	1,5452	1,5535	1,535	1,5535	0,004128
12.07.2006	1,5435	1,562	1,5355	1,5602	0,004304
13.07.2006	1,567	1,593	1,567	1,5821	0,013939
14.07.2006	1,597	1,605	1,567	1,581	-0,0007
17.07.2006	1,585	1,6055	1,5795	1,586	0,003158
18.07.2006	1,581	1,5905	1,57	1,5809	-0,00322
19.07.2006	1,5809	1,586	1,551	1,551	-0,01909
20.07.2006	1,551	1,563	1,543	1,5447	-0,00407
21.07.2006	1,5447	1,557	1,5425	1,5495	0,003103
24.07.2006	1,5495	1,56	1,539	1,54	-0,00615
25.07.2006	1,5475	1,5475	1,5245	1,5325	-0,00488
26.07.2006	1,5325	1,5365	1,5145	1,518	-0,00951
27.07.2006	1,518	1,5185	1,4885	1,4958	-0,01473
28.07.2006	1,4975	1,5067	1,485	1,4893	-0,00435
31.07.2006	1,484	1,497	1,478	1,4966	0,00489
01.08.2006	1,494	1,511	1,492	1,5	0,002269
02.08.2006	1,505	1,513	1,4905	1,494	-0,00401
03.08.2006	1,495	1,5075	1,488	1,4928	-0,0008
04.08.2006	1,49	1,4915	1,461	1,486	-0,00457
07.08.2006	1,47	1,476	1,455	1,462	-0,01628
08.08.2006	1,4645	1,471	1,456	1,46	-0,00137
09.08.2006	1,4645	1,465	1,438	1,4425	-0,01206
10.08.2006	1,4495	1,46	1,4375	1,459	0,011374
11.08.2006	1,4495	1,4572	1,439	1,4515	-0,00515
14.08.2006	1,4495	1,468	1,444	1,4655	0,009599
15.08.2006	1,465	1,4796	1,4505	1,4515	-0,0096
16.08.2006	1,4495	1,4541	1,4365	1,44	-0,00795

17.08.2006	1,439	1,442	1,43	1,4372	-0,00195
18.08.2006	1,439	1,455	1,4345	1,452	0,010245
21.08.2006	1,4495	1,466	1,4405	1,447	-0,00345
22.08.2006	1,449	1,459	1,445	1,457	0,006887
23.08.2006	1,4535	1,476	1,451	1,476	0,012956
24.08.2006	1,481	1,4923	1,469	1,4923	0,010983
25.08.2006	1,4778	1,49	1,47	1,489	-0,00221
28.08.2006	1,485	1,489	1,4765	1,483	-0,00404
29.08.2006	1,4778	1,4825	1,4675	1,4787	-0,0029
30.08.2006	1,4778	1,478	1,4611	1,4611	-0,01197
31.08.2006	1,46	1,467	1,4445	1,4627	0,001094
01.09.2006	1,4625	1,4725	1,459	1,4616	-0,00075
04.09.2006	1,458	1,462	1,437	1,445	-0,01142
05.09.2006	1,452	1,453	1,441	1,4473	0,00159
06.09.2006	1,448	1,472	1,446	1,47	0,015563
07.09.2006	1,467	1,4835	1,465	1,4703	0,000204
08.09.2006	1,4745	1,4895	1,4625	1,4765	0,004208
11.09.2006	1,4765	1,492	1,47	1,4852	0,005875
12.09.2006	1,48	1,4815	1,464	1,471	-0,00961
13.09.2006	1,4765	1,4775	1,462	1,4685	-0,0017
14.09.2006	1,4765	1,485	1,4625	1,4683	-0,00014
15.09.2006	1,473	1,4785	1,46	1,469	0,000477
18.09.2006	1,463	1,465	1,455	1,463	-0,00409
19.09.2006	1,46	1,4715	1,458	1,4645	0,001025
20.09.2006	1,47	1,477	1,4635	1,47	0,003749
21.09.2006	1,4765	1,51	1,465	1,508	0,025522
22.09.2006	1,507	1,549	1,502	1,519	0,007268
25.09.2006	1,516	1,5335	1,499	1,531	0,007869
26.09.2006	1,518	1,531	1,509	1,511	-0,01315
27.09.2006	1,506	1,5085	1,486	1,4927	-0,01219
28.09.2006	1,49	1,5095	1,486	1,5037	0,007342
29.09.2006	1,4995	1,5225	1,4915	1,513	0,006166
02.10.2006	1,51	1,517	1,4955	1,4955	-0,01163
03.10.2006	1,497	1,5165	1,4915	1,514	0,012295
04.10.2006	1,512	1,5225	1,501	1,503	-0,00729
05.10.2006	1,495	1,5035	1,487	1,495	-0,00534
06.10.2006	1,491	1,501	1,484	1,4965	0,001003
09.10.2006	1,5	1,506	1,4935	1,497	0,000334
10.10.2006	1,495	1,501	1,487	1,4883	-0,00583
11.10.2006	1,485	1,496	1,48	1,484	-0,00289
12.10.2006	1,49	1,495	1,468	1,4705	-0,00914
13.10.2006	1,4765	1,477	1,459	1,47	-0,00034
16.10.2006	1,4765	1,4785	1,4635	1,472	0,00136
17.10.2006	1,4765	1,484	1,466	1,481	0,006096
18.10.2006	1,4765	1,4835	1,4575	1,4655	-0,01052

19.10.2006	1,465	1,468	1,4515	1,458	-0,00513	
20.10.2006	1,455	1,463	1,451	1,4598	0,001234	
23.10.2006	1,4603	1,47	1,4603	1,466	0,004238	
24.10.2006	1,4765	1,48	1,465	1,4657	-0,0002	
25.10.2006	1,469	1,469	1,457	1,459	-0,00458	
26.10.2006	1,455	1,4575	1,44	1,4425	-0,01137	
27.10.2006	1,441	1,452	1,44	1,443	0,000347	
30.10.2006	1,443	1,461	1,443	1,458	0,010341	
31.10.2006	1,458	1,469	1,4465	1,4565	-0,00103	
01.11.2006	1,454	1,46	1,4465	1,455	-0,00103	November 2006 (annual volatility)
02.11.2006	1,454	1,4765	1,45	1,472	0,011616	0,010287
03.11.2006	1,466	1,4725	1,4385	1,4493	-0,01554	16,33%
06.11.2006	1,454	1,454	1,44	1,4427	-0,00456	
07.11.2006	1,44	1,449	1,4325	1,4465	0,00263	
08.11.2006	1,444		1,443	1,4555	0,006203	
09.11.2006	1,45	1,454	1,4395	1,446	-0,00655	
10.11.2006	1,447	1,454	1,437	1,447	0,000691	
13.11.2006	1,4525	1,453	1,443	1,4525	0,003794	
14.11.2006	1,4475	1,4523	1,441	1,45	-0,00172	
15.11.2006	1,445	1,452	1,441	1,445	-0,00345	
16.11.2006	1,443	1,448	1,43	1,4406	-0,00305	
17.11.2006	1,441	1,4527	1,436	1,445	0,00305	
20.11.2006	1,442	1,4605	1,442	1,4505	0,003799	
21.11.2006	1,447	1,47	1,443	1,466	0,010629	
22.11.2006	1,459	1,478	1,455	1,4744	0,005714	
23.11.2006	1,472	1,487	1,4675	1,477	0,001762	
24.11.2006	1,479	1,4872	1,464	1,466	-0,00748	
27.11.2006	1,464		1,458	1,476	0,006798	
28.11.2006	1,47	1,489	1,47	1,47	-0,00407	
29.11.2006	1,469	1,475	1,459	1,464	-0,00409	
30.11.2006	1,462	1,464	1,444	1,4535	-0,0072	
01.12.2006	1,45	1,4605	1,436	1,4522	-0,00089	December 2006 (annual volatility)
04.12.2006	1,455	1,46	1,445		-0,00221	0,010391
05.12.2006	1,445	1,457	1,441	1,4455	-0,00242	16,50%
06.12.2006	1,444	1,452	1,438	1,4445	-0,00069	
07.12.2006	1,4435	1,4485	1,4195	1,4286	-0,01107	
08.12.2006	1,432	1,4375	1,424	1,43	0,00098	
11.12.2006	1,434	1,4385	1,419	1,421	-0,00631	
12.12.2006	1,42	1,4315	1,417	1,428	0,004914	
13.12.2006	1,428	1,429	1,415	1,42	-0,00562	
14.12.2006	1,4185	1,4258	1,4155	1,4205	0,000352	
15.12.2006	1,4195	1,427	1,4145		0,003864	
18.12.2006	1,423	1,4311	1,42	1,431	0,0035	
19.12.2006	1,4305	1,438	1,426	1,431	0	
20.12.2006	1,428	1,4328	1,4225	1,4275	-0,00245	

21.12.2006	1,428	1,4299	1,423	1,4263	-0,00084	
22.12.2006	1,426	1,4309	1,4175	1,425	-0,00091	
25.12.2006	1,426	1,431	1,421	1,423	-0,0014	
26.12.2006	1,4245	1,428	1,4205	1,4235	0,000351	
27.12.2006	1,4245	1,4268	1,419	1,423	-0,00035	
28.12.2006	1,425	1,426	1,408	1,413	-0,00705	
29.12.2006	1,4115	1,418	1,406	1,415	0,001414	
01.01.2007				1,415	0	January 2007 (annual volatility)
02.01.2007	1,4148	1,4148	1,404	1,4055	-0,00674	0,01041
03.01.2007	1,4058	1,4094	1,404	1,408	0,001777	16,53%
04.01.2007	1,409	1,4223	1,405	1,4185	0,00743	
05.01.2007	1,421	1,45	1,42	1,4425	0,016778	
08.01.2007	1,447	1,4563	1,4345	1,4355	-0,00486	
09.01.2007	1,435	1,45	1,425	1,4495	0,009705	
10.01.2007	1,446	1,459	1,4405	1,444	-0,0038	
11.01.2007	1,441	1,4443	1,43	1,4333	-0,00744	
12.01.2007	1,425	1,4378	1,425	1,429	-0,003	
15.01.2007	1,428	1,4318	1,4195	1,4235	-0,00386	
16.01.2007	1,4235	1,4348	1,4185	1,431	0,005255	
17.01.2007	1,43	1,4358	1,4215	1,4255	-0,00385	
18.01.2007	1,423	1,426	1,415	1,4183	-0,00506	
19.01.2007	1,418	1,4218	1,409	1,4155	-0,00198	
22.01.2007	1,41	1,4155	1,4	1,414	-0,00106	
23.01.2007	1,413	1,4163	1,404	1,4125	-0,00106	
24.01.2007	1,41	1,4188	1,404	1,4135	0,000708	
25.01.2007	1,412	1,428	1,409	1,4275	0,009856	
26.01.2007	1,432	1,4378	1,42	1,4325	0,003497	
29.01.2007	1,435	1,435	1,4195	1,43	-0,00175	
30.01.2007	1,4285	1,4318	1,418	1,4201	-0,00695	
31.01.2007	1,42	1,4238	1,406	1,406	-0,00998	
01.02.2007	1,406	1,4106	1,396	1,4033	-0,00192	February 2007 (annual volatility)
02.02.2007	1,4015	1,4075	1,39	1,403	-0,00021	0,010554
05.02.2007	1,4025	1,4108	1,396	1,3975	-0,00393	16,75%
06.02.2007	1,4	1,4048	1,393	1,4005	0,002144	
07.02.2007	1,4	1,4053	1,393	1,4026	0,001498	
08.02.2007	1,405	1,4075	1,398	1,4015	-0,00078	
09.02.2007	1,4025	1,404	1,3905	1,4035	0,001426	
12.02.2007	1,405	1,4155	1,4015	1,4101	0,004692	
13.02.2007	1,412	1,4135	1,397	1,3991	-0,00783	
14.02.2007	1,395	1,4	1,381	1,387	-0,00869	
15.02.2007	1,387	1,3943	1,38	1,3922	0,003742	
16.02.2007	1,389	1,3928	1,381	1,3853	-0,00497	
19.02.2007	1,385	1,389	1,376	1,38	-0,00383	
20.02.2007	1,3785	1,387	1,3735	1,383	0,002172	
21.02.2007	1,3815	1,3893	1,376	1,3825	-0,00036	

22.02.2007	1,38	1,3858	1,375	1,381	-0,00109		
23.02.2007	1,379	1,3855	1,376	1,381	0		
26.02.2007	1,38	1,389	1,375	1,385	0,002892		
27.02.2007	1,383	1,418	1,381	1,418	0,023547		
28.02.2007	1,413	1,434	1,406	1,412	-0,00424		
01.03.2007	1,4125	1,441	1,405	1,4242	0,008603	March 2007 (annual volatility)	
02.03.2007	1,4175	1,4343	1,4115	1,4335	0,006509		0,01057
05.03.2007	1,444	1,4625	1,4395	1,4465	0,009028		16,78%
06.03.2007	1,445	1,447	1,427	1,4315	-0,01042		
07.03.2007	1,429	1,436	1,42	1,4281	-0,00238		
08.03.2007	1,429	1,4318	1,4145	1,421	-0,00498		
09.03.2007	1,42	1,4235	1,404	1,4065	-0,01026		
12.03.2007	1,404	1,415	1,396	1,404	-0,00178		
13.03.2007	1,404	1,424	1,4015	1,4235	0,013793		
14.03.2007	1,431	1,4345	1,4155	1,42	-0,00246		
15.03.2007	1,42	1,42	1,3995	1,4026	-0,01233		
16.03.2007	1,4	1,4125	1,398	1,407	0,003132		
19.03.2007	1,406	1,406	1,39	1,396	-0,00785		
20.03.2007	1,394	1,4015	1,3865	1,398	0,001432		
21.03.2007	1,397	1,4032	1,384	1,385	-0,00934		
22.03.2007	1,383	1,3861	1,375	1,3836	-0,00101		
23.03.2007	1,383	1,3925	1,3775	1,384	0,000289		
26.03.2007	1,384	1,391	1,3785	1,388	0,002886		
27.03.2007	1,387	1,393	1,3815	1,3885	0,00036		
28.03.2007	1,39	1,3991	1,387	1,394	0,003953		
29.03.2007	1,3915	1,3941	1,3835	1,3913	-0,00194		
30.03.2007	1,385	1,394	1,3775	1,39	-0,00093		
02.04.2007	1,388	1,3925	1,3815	1,3885	-0,00108		
03.04.2007	1,384	1,3862	1,3665	1,3694	-0,01385		
04.04.2007	1,37	1,379	1,363	1,371	0,001168	April 2007 (annual volatility)	
05.04.2007	1,3665		1,361	1,3635	-0,00549	Stdev	
06.04.2007	1,365		1,36	1,363	-0,00037	0,010499	16,67%

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AUTOBIOGRAPHY

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ÖZGEÇMİŞ

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