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"Risk Management with Derivatives: Applications for Pricing Futures and Options"

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ABSTRACT

The end of Bretton Woods International Payment and Exchange Rate System in the mid 70's, the price and interest rate fluctuations and high inflation rates due to the oil crisis resulted in the increase of the financial risks all over the world. Furthermore, technological improvements and globalization made the risk transfer among the countries easy. All these changes increased the need to understand, to measure and to avoid ''**risk**''. Forward, futures, swap and option contracts which are called derivative market instruments, are one of the risk management techniques and they are used to hedge against financial risk.

The purpose of this thesis as titled '' Risk Management with Derivatives: Applications with Futures and Options'',first of all the derivatives markets and instruments are theoritically reviewed and then the derivative pricing methods analyzed. Foreign exchange risk is analyzed by some indicatiors in market of Turkey. Finally in this study ,futures and options are priced with pricing method such as Black&Scholes model to understand the importance of the pricing methods in the risk management activity. Futures and Options are priced for information to find the appropriate hedging strategies in the risk management manner.

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ABBREVIATIONS

AMEX American Stock Exchange (New York)

BIS Bank of International Settlements

BM & F Bolsa de Mercadorias & Futuros

CAC Compagie des Agents de Change

CAMELS **C**apital Adequacy, **A**sset Quality, **M**anagement, **E**arnings, **L**iquidity, **S**ensivity to market risk.

CBOE Chicago Board Options Exchange Inc

CBOT Board of Trade of the City of Chicago

CFTC Commodity Futures Trading Commission

CMB Capital Markets Board of Turkey

CME Chicago Mercantile Exchange

DAX Detscher Aktienindex

DJIA Dow Jones Industrial Average

EUR Euroe

ETFs Exchange Traded Funds

FII Financial Industry Institute

FRAs Forward rate agreements

FT Financial Times

FX Foreign exchange

IDEM Italian Derivatives Market

IFC International Finance Corporation

IGE Istanbul Gold Exchange

IME Izmir Mercantile Exchange

IMM International Monetary Market

ISE Istanbul Stock Exchange

JPN Japan

KCBT Kansas City Board of Trade

LEAPS Long Term Equity Anticipation Securities

LIFFE London International Financial Futures Exchange

MMI Major Market Index

NFA National Futures Association

NYSE New York Stock Exchange

OCC Options Clearing Corporation

OPEC Organization of the Petroleum Exporting Countries

OTC Over-the-Counter

PCX Pacific Exchange Inc

PHLX Philadelphia Stock Exchange Inc

S & P Standard and Poor's

SAFEX South African Futures Exchange

SEC Security and Exchange Commission

SIMEX Singapore International Monetary Exchange

SIS State Institute of Statistics

TAKASBANK Istanbul Stock Exchange Settlement and Custody Bank

TEOS TurkDex Exchange Operations System

TURKDEX Turkish Derivatives Exchange

USA United States of America

USDA/FAS United States Department of Agriculture/ Foreign Agricultural Service

TRY New Turkish Lira

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I. INTRODUCTION

1.1 Aim of this Study

The aim of this study is pricing the futures and options for hedging activity in the derivatives markets such as Turkey Derivative Exchange (TURKDEX) and Chicago Board of Trade (CBOT), to price this instruments we use the theoretical futures pricing method and Black & Scholes theoretical option pricing model to find these instruments theoretical value that can be able to compare between these theoretical value and their market value and then able to determine buy or sell underlying assets.

1.2 Broad Problem Area

Especially the price volatility in both financial market and goods market increased the need of the other markets such as derivative market to eliminate or transfer the risk that increased by the price volatility. The need of the elimination of risk increased the use of the derivative market in the manner of risk management activity. Also in the derivative markets, the participants can generate additional return by the price changes and hedge their position caused by the price volatility to using derivative instruments. But in this process, to known the theoretical price (which measured by the pricing models) of the derivative instrument is also very important to give the buying or selling decisions. Consequently, in this study focus on the importance of the derivative markets and instruments and the pricing models of futures and options.

1.3 Methodology

In this study, to calculate theoretical European option price which is written on Dow Jones Industrial Average Index, Black & Scholes (1973) Option Pricing Model will be used, and necessary data for this calculation was obtained by Bank of International Settlements (BIS), Federal Reserve Bank (FED), Chicago Board of Exchange and Chicago Board of Trade.

In application of pricing of futures on TRY/US Dollars in Turkey, to calculate theoretical future price of TRY/US Dollars, necessary data was obtained by Turkey Derivative Exchange (TURKDEX), Central Bank of Republic of Turkey (TCMB), Dışbank and Tacirler Securities.

The study generally depended on data search method related to the types of derivatives and the derivatives markets. In this respect, the surveys conducted by institutions such as the Chicago Board of Trade, International Monetary Found (IMF), the World Bank, the Bank for International Settlements (BIS), as well as their research reports constitute the most important part of the sources. The researches and studies done by institutions such as the Istanbul Stock Exchange, the Union of Chambers of Commerce, Industry, the Maritime Trade and Commodity Exchange of Turkey, the Turkish Banking Association, Turkey Derivative Exchange and the Capital Markets Board of Turkey were very helpful sources in analyzing of the derivatives markets in Turkey.

In addition, the impressions of the meetings, seminars related to derivatives markets contributed to concentrate on the subject.

1.3 Structure of the study

The first chapter shows the aim of this study, broad problem statement, methodology and the structures of the study.

The second chapter starts with defining the derivatives markets with giving information about history of derivatives and reasons of the derivatives markets transactions with analyzing concept of risk.

In the third chapter, types of derivative instruments are briefly defined and give some information which is related similarities and differences of these instruments. One of these instruments is called options are especially analyzed with giving information about strategy upon options. And then, Dow Jones Industrial Average Index option is explained and components of option pricing are showed with explaining Black & Scholes option pricing model.

The fourth chapter consists of derivatives markets transactions in Turkey. Reasons of derivatives markets are defined with giving some indicator about volume of transaction of derivatives and then, foreign exchange risk is analyzed with some indicators in market of Turkey.

The fifth chapter consists with applications. In first application, the European call option on Dow Jones Industrial Average Index is theoretically priced between the period of 10 days with using Black & Scholes option pricing model and applied some strategy upon this theoretical price and then how much we can earn are calculated with different quantity at different level of index. And then we looked our real gain in real index level at maturity date.

In second and last application, future contract of TRYUS Dollar is theoretically priced and improved some strategy which is includes hedging and speculating upon this theoretical future price of TRYUS Dollar.

The sixth chapter consists with conclusion and gives some recommendation about using derivatives instruments in risk management.

CHAPTER 2- DERIVATIVE MARKETS

2.1 INTRODUCTION

Derivative is a financial instrument whose value is derived from the price of a more basic asset called underlying. The underlying may not necessarily be a tradable product. Examples of underlyings are shares, commodities, currencies, credits, stock market indices, weather temperatures, sunshine, results of sport matches, wind speed and so on. Basically, anything which may have to a certain degree an unpredictable effect on any business activity can be considered as an underlying of a certain derivative (Dodd 2002).

All derivatives can be divided into two big classes:

- Linear
- Non-linear

Linear are derivatives whose values depend linearly on the underlying's value. This includes;

- Forwards and Futures
- Swaps

Non-linear are derivatives whose value is a non-linear function of the underlying. This includes;

- Options
- Convertibles
- Equity Linked Bonds
- Reinsurances

One can add some other instruments to both of the two classes. For example, bonds can be viewed as non-linear derivatives with the interest rate being a non-tradable underlying.

Derivatives are traded on derivatives exchanges, such as the Chicago Mercantile Exchange (CME) which employs both open outcry in "pits" and electronic order matching systems, and in over-the-counter markets (OTC) where trading is usually centered around a few dealers and conducted over the phone or electronic messages (Dodd 2002).

Derivative instruments play a useful and important role in hedging and risk management,

- Farmers can use derivatives the hedge the risk that the price of their crops fall before they are harvested and brought to the market.
- Banks can use derivatives to reduce the risk that the short-term interest rates they pay to their depositors will rise and reduce the profit they earn on fixed interest rate loans and securities. Mortgage giants Fannie Mae and Freddie Mac – the world largest end-users of derivatives – use interest rate swaps, options and swaptions to hedge against the prepayment risk associated with home mortgage financing.
- Electricity producers hedge against unseasonable changes in the weather.
- Pension funds use derivatives to hedge against large drops in the value of their portfolios, and insurance companies sell credit protection to banks and securities firms through the use of credit derivatives (Dodd 2002).

Derivatives can also be used for unproductive purposes such as the avoidance of taxation, the outflanking prudential regulation of financial markets and the manipulation of accounting rules, credit ratings and financial reports (Dodd 2002).

2.2 A Brief History of Derivative Markets

Derivatives have played a role in commerce and finance for thousands of years. The first known instance of derivatives trading dates to 2000 B.C. when merchants, in what is now called Bahrain Island in the Arab Gulf, made consignment transactions for goods to be sold in India (Markham (1994) and Markham (1987)).

Derivatives trading, dating back to the same era, also occurred in Mesopotamia (Swan, 1993). The trading in Mesopotamia is evidenced by many clay tablets in the cuneiform writing. Derivatives trading in an exchange environment and with trading rules can be traced back to Venice in the 12th Century (Swan 1993).

Forward and options contracts were traded on commodities, shipments and securities in Amsterdam after 1595 (Edward Chancellor (1999) for an excellent analysis of the meaning of the 1595 laws).

The Japanese traded futures-like contracts on warehouse receipts or rice in the 1700s. In the United States of America, forward and futures contracts have been formally traded on the Chicago Board of Trade since 1849. As of 2003, the world's largest derivative exchange is the Eurex which is an entirely electronic trading "exchange" that is based in Frankfurt, Germany (Nurcan,Belma 2005 ,p 91.).

2.3 The Reasons of the Derivative Markets Transaction

The USA left the issue of gold standard in the middle of 1970s and as a result of this Bretton Woods International Payment and Exchange Rate System ended. After this date, there have been continuous fluctuations both in the exchange rates and in the interest rates in the international market. This situation affected the enterprises and the markets negatively and also the entrepreneurs could not foresee the future and were not able to act in an organized way (Gündoğdu, 2000, p 64 ; Nurcan,Belma 2005 ,p 92.).

Besides, the fuel crisis happened in the middle of 1970s brought about fluctuations in the prices of the products. Since Organization of the Petroleum Exporting Countries (OPEC) has increased the fuel prices extremely, the costs of production have also increased. Within the framework of this process, many countries had to meet with high degrees of unemployment and high inflation. In the scope of preventing inflation, limitation of money demand and with the intention of realizing this aim, manipulation of interest rates as a short term tool has gained importance.

On the other hand, technological improvements provided the integration of the markets to some extent. Those markets were not acting in a harmony in terms of time and geography. The best example of this improvement is the 24 hours continuous commerce facility of New York-London-Tokyo axis (Akgiray, 1998, p2).

In addition to this globalization case, which has appeared with the contribution of technological improvements in the financial markets, globalization of financial risks has also appeared. Today, any negativity that occurs in a firm affects the others and it can even affect

the economy of the whole country. In addition to this, it can also trigger a financial crisis which can have effects beyond the limits of that country (Toraman, 2002, p 21).

The rapid improvements of the technology and the globalization caused international competition to increase. Especially, the increase of the competition among the developed and developing countries caused the financial risks to be more important and more complex. The increase of risks in the market paved the way of the new financial techniques which prevents from risks and derivative market is one of them (Nurcan, Belma 2005, p 93.).

2.4 Techniques of Risk Management

The concept of 'risk' and 'uncertainty' are the great importance for the participators of the market. These two concepts are always confused and there are differences between them. Uncertainty is the unforeseeable part of the progress and the results of the phenomenon and also it cannot be measured. For this reason, you cannot ascribe possibility to uncertainty, the results of it cannot be manipulated and it is not possible to escape from uncertainty. On the other hand, risk is measurable, can be calculated and it is possible to ascribe certain possibilities to the results of risks. There are many tools and markets to measure risks (Serdengeçti, 2005).

In order to avoid risks, the first step is the definition of the factors of risk and the correct measure of it. One of the methods is CAMEL. It is the analysis of capital adequacy of the firm in credit risk analysis, the quality of properties, management, gain structure and liquidation. Another method is the Value at Risk = VAR one. The value at risk is the determination of the maximum loss in the note case at the end of a reverse market movement which is expected for a standard time interval (usually one day) in a long term section in a %99 trust interval (usually 100 days). Another method which is commonly used for measuring the market risk is scenario analysis. It is used to asses how some possible changes that can occur under the market circumstances affect the value of note case. Stress test, aims to guess the possible maximum loss in the value of note case when some extraordinary but possible situations occur (Erçel, 1999; Torama, 2002 p24-28).

In addition to these methods, another method is hedging activities with derivative instruments which are commonly used in the risk management operations. These instruments include; options, swap, futures and forward contracts.

2.5 Derivative Markets Transactions and Its Benefits

Capital markets, is divided into two dimensions and these are spot markets and derivative markets. This division is made according to the term structures of the tools that are operated in these markets. Spot markets are the ones in which the value in other words, the cost of the goods and securities are paid cash and the delivery of the good is also done simultaneously. In contrast, derivative markets are the ones in which the payment is done at the end of the term and the physical delivery and the monetary consensus is also done at the end (ISE, 2002, P.2).

A derivative product is a contract which is produced upon a financial value or a good. This contract also provides the transfer of risks from the sides that are unwilling to take risks to the sides which are willing to take risks. For example, 'foreign money future contract' is a contract in which the foreign money is assessed according to an exchange rate which was determined in advance. The basis of this contract is spot product which is the foreign money. The scope of this derivative is the delivery promise (Akçaoğlu, 2002,p.7).

Derivative market operations have been a part of the commerce life for over 150 years. These operations were mostly good oriented before the termination of Bretton Woods contract. However; today they are mostly financial tools oriented.

The size of the derivatives market is usually described in terms of the notional amount. The resulting number grossly overstates the value of the contracts (Table 2.1).

Today the size of derivatives markets is enormous, and by some measures it exceeds that for bank lending, securities and insurance. Data collected by the Bank of International Settlements (BIS) show that the volumes outstanding of over-the-counter derivatives expanded at a brisk pace in the first half of 2006. Notional amounts of all types of OTC

contracts stood at $370 trillion at the end of June, 24% higher than six months before (Table 2.1). Growth was particularly strong in the credit segment, where the notional amounts of outstanding credit default swaps (CDS) increased by 46%. Rapid growth was also recorded in other market segments. Open positions in interest rate derivatives rose by 24%, while those in foreign exchange (FX) contracts expanded by 22%. Equity and commodity contracts grew at 17% and 18%, respectively. Gross market values, which measure the cost of replacing all existing contracts and thus represent a better measure of market risk at a given point in time than notional amounts, increased by 3% to $10 trillion at the end of June 2006 (www.bis.org).

Notional amounts of foreign exchange derivatives increased by 22% to $38 trillion, while gross market values rose by 14% to $1.1 trillion, close to the level attained 12 months before (Table 2.2). Growth in the notional amounts of FX options (29%) outpaced the change in the volumes of currency swaps (14%). Forwards, which account for roughly half of total OTC FX derivatives when measured in terms of notional amounts, grew in line with the market total. There were no significant changes in the currency composition of FX derivatives. The dollar remained the most important vehicle currency, well ahead of the euro. 83% of all contracts (measured by notional amounts) had one leg denominated in US dollars, compared to 40% for the euro and 25% for the Japanese yen (Table 2.3)(www.bis.org).

TABLE 2.1 THE GLOBAL OTC DERIVATIVES MARKET

Amounts outstanding in billions of US dollars (By risk category and instrument)

	Notional amounts outstanding					Gross market values				
Risk Category / Instrument	Jun 2004	Dec 2004	Jun 2005	Dec 2005	Jun 2006	Jun 2004	Dec 2004	Jun 2005	Dec 2005	Jun 2006
Total contracts	220,058	257,894	281,493	297,670	369,906	6,395	9,377	10,605	9,749	10,074
Foreign exchange contracts	26,997	29,289	31,081	31,364	38,111	867	1,546	1,141	997	1,134
Forwards and forex swaps	13,926	14,951	15,801	15,873	19,415	308	643	464	406	436
Currency swaps	7,033	8,223	8,236	8,504	9,669	442	745	549	453	533
Options	6,038	6,115	7,045	6,987	9,027	116	158	129	138	166
Interest rate contracts	164,626	190,502	204,795	211,970	262,296	3,951	5,417	6,699	5,397	5,549
Forward rate agreements	13,144	12,789	13,973	14,269	18,117	29	22	31	22	25
Interest rate swaps	127,570	150,631	163,749	169,106	207,323	3,562	4,903	6,077	4,778	4,944
Options	23,912	27,082	27,072	28,596	36,856	360	492	592	597	579
Equity-linked contracts	4,521	4,385	4,551	5,793	6,783	294	498	382	582	671
Forwards and swaps	691	756	1,086	1,177	1,423	63	76	88	112	147
Options	3,829	3,629	3,464	4,617	5,361	231	422	294	470	523
Commodity contracts	1,270	1,443	2,940	5,434	6,394	166	169	376	871	718
Gold	318	369	288	334	456	45	32	24	51	77
Other commodities	952	1,074	2,652	5,100	5,938	121	137	351	820	641
Forwards and swaps	503	558	1,748	1,909	2,186					
Options	449	516	904	3,191	3,752					
Credit default swaps	...	6,396	10,211	13,908	20,352	...	133	188	243	294
Single-name instruments	...	5,117	7,310	10,432	13,873	...	112	136	171	186
Multi-name instruments	...	1,279	2,901	3,476	6,479	...	22	52	71	109
Unallocated	22,644	25,879	27,915	29,199	35,969	1,116	1,613	1,818	1,659	1,707
Memorandum Item:										
Gross Credit Exposure						1,478	2,075	1,897	1,900	2,032

Source:http://www.bis.org/statistics/derstats

TABLE 2.2 THE GLOBAL OTC FOREIGN EXCHANGE DERIVATIVES MARKET

Amounts outstanding in billions of US dollars (By instrument and counterparty)

	Notional amounts outstanding					Gross market values				
Instrument / counterparty	Jun 2004	Dec 2004	Jun 2005	Dec 2005	Jun 2006	Jun 2004	Dec 2004	Jun 2005	Dec 2005	Jun 2006
Total contracts	**26,997**	**29,289**	**31,081**	**31,364**	**38,111**	**867**	**1,546**	**1,141**	**997**	**1,134**
reporting dealers	10,796	11,668	12,179	12,161	15,281	247	486	377	323	367
other financial institutions	10,113	11,417	12,334	12,721	15,120	352	648	470	412	471
non-financial customers	6,088	6,204	6,568	6,482	7,710	267	413	294	261	296
Outright forwards and foreign exchange swaps	**13,926**	**14,951**	**15,801**	**15,873**	**19,415**	**308**	**643**	**464**	**406**	**436**
reporting dealers	5,818	5,933	6,108	5,713	7,292	125	260	173	154	156
other financial institutions	5,333	5,939	6,047	6,564	7,758	109	243	181	155	171
non-financial customers	2,775	3,079	3,645	3,596	4,365	75	140	110	97	108
Currency swaps	**7,033**	**8,223**	**8,236**	**8,504**	**9,669**	**442**	**745**	**549**	**453**	**533**
reporting dealers	2,709	3,122	3,098	3,268	3,757	85	169	151	108	137
other financial institutions	2,816	3,477	3,689	3,669	4,243	210	358	248	211	246
non-financial customers	1,508	1,623	1,449	1,567	1,668	147	218	150	133	151
Options	**6,038**	**6,115**	**7,045**	**6,987**	**9,027**	**116**	**158**	**129**	**138**	**166**
reporting dealers	2,268	2,613	2,973	3,181	4,231	38	57	53	60	74
other financial institutions	1,965	2,001	2,598	2,488	3,118	33	46	42	47	53
non-financial customers	1,805	1,502	1,474	1,318	1,677	45	55	34	31	38

Source:http://www.bis.org/statistics/derstats

TABLE 2.3 THE GLOBAL OTC FOREIGN EXCHANGE DERIVATIVES MARKET

Amounts outstanding in billions of US dollars (By currency)

Currency	Notional amounts outstanding					Gross market values				
	Jun 2004	Dec 2004	Jun 2005	Dec 2005	Jun 2006	Jun 2004	Dec 2004	Jun 2005	Dec 2005	Jun 2006
All currencies	**26,997**	**29,289**	**31,081**	**31,364**	**38,111**	**867**	**1,546**	**1,141**	**997**	**1,134**
Australian dollar	943	1,092	1,236	1,315	1,687	42	54	39	40	37
Canadian dollar	968	1,171	1,217	1,379	1,675	35	71	56	70	75
Danish krone	33	119	125	136	155	1	5	3	2	4
Euro	10,312	11,900	12,404	12,857	15,348	380	752	512	397	472
Hong Kong dollar	591	605	556	493	641	3	5	4	3	3
Japanese yen	6,516	7,076	6,907	7,578	9,510	178	258	220	256	242
New Zealand dollar	10	14	15	22	41	0	0	2	0	1
Norwegian krone	88	140	135	134	185	2	7	4	3	3
Pound sterling	4,614	4,331	4,273	4,424	5,219	130	220	150	121	148
Swedish krona	767	957	1,039	1,067	1,172	18	41	48	24	31
Swiss franc	1,344	1,452	1,586	1,690	2,096	37	60	54	46	50
Thai baht	2	2	3	5	5	0	0	0	0	0
US dollar	24,551	25,726	27,584	26,297	31,771	808	1,408	1,024	867	967
Other	3,253	3,994	5,082	5,331	6,717	99	210	168	165	235

Source:http://www.bis.org/statistics/derstats

example: In Korea market seen that the term deposit transaction application decrease the volatility of the spot market. In addition, the futures prices are the guides for spot market prices (Erdoğan and Kayacan, 1998).

The costs of the investors are low because the trade commissions are generally lower than the spot markets. Investors who are qualified in terms of knowledge but have inadequate capital (and thus cannot have good status) can have the opportunity to have good statuses (leverage) with reasonable amounts in derivative markets.

With the addition of the term deposit markets to the present markets, the circulation of money increases and the activity of the markets rise (Arıkan, 2000, p.10).

2.6 Types of Traders

Derivatives markets have been outsdandingly successfull. The main reason is that attracted many different types of traders and have a great deal of liquidity. When an investor wants to take one side of a contract, there is usually no problem in finding someone that is prepared to take the other side (Hull, 2005,p.8).

Three broad categories of traders can be identified: hedgers, speculators,and arbitrageurs.

1. Hedgers; use derivatives to reduce the risk that they face from potential future movements in a market variable.

2. Speculators; use them to bet on the future direction of a market variable.

3. Arbitrageurs; take offsetting positions in two or more instruments to lock in a profit (Hull,2005,p.8).

CHAPTER 3- DERIVATIVE INSTRUMENTS

3.1 Types of Derivative Instruments

3.1.1 Forward Contracts

A forward contract is an agreement to buy or sell an asset at a certain future time for a certain price. It can be contrasted with a spot contract, which is an agreement to buy or sell asset today. A forward contract is traded in the over-the-counter (OTC) market, usually between two financial institutions or between a financial institution and one of its clients (Hull,2005, p.3).

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 the same price (Hull 2005, p.4).

Forward contracts on foreign exchange are very popular. Most large banks employ both spot traders and forward traders. Spot traders are trading a foreign currency for almost immediate delivery. Forward traders are trading for delivery at a future time (Hull, 2005, p.4).

The main features of forward contracts are :

- They are bilateral contracts and hence exposed to counter-party risk.
- Each contract is custom designed, and hence is unique in terms of contract size, expiration date and the asset type and quality.
- The contract price is generally not available in public domain.
- The contract has to be settled by delivery of the asset on expiration date.
- In case, the party wishes to reverse the contract, it has to compulsorily go to the same counter party, which being in a monopoly situation can command the price it wants (www.riskglossary.com).

3.1.2 Futures Contracts

Like a forward contract, a future contract is an agreement between two parties to buy or sell an asset at a certain time in the future for a certain price. Unlike forward contracts, future contracts are normally traded on an exchange. To make trading possible, the exchange specifies certain standardized features of the contract. As the two parties to the contract do not necessarily know each other, the exchange also provides a mechanism that gives the two parties a guarantee that the contract will be honored (Hull, 2005, p.6).

The largest exchanges on which futures contracts are traded are the Chicago Board of Trade (CBOT) and the Chicago Mercantile Exchange (CME). On these and other exchanges throughout the world, a very wide of the commodities and financial assets form the underlying assets in the various contracts. The commodities include pork bellies, live cattle, sugar, wool, lumber, copper, aluminum, gold, and tin (Hull, 2005, p.6).

The financial assets include stock indices, currencies, and Treasury bonds. Future prices are regularly reported in the financial press. For example: on September 1, the December futures price of gold is quoted as $ 300. This the price, exclusive of commissions, at which traders can agree to buy or sell gold for December delivery. It is determined on the floor of the exchange in the same way as other prices (i.e., by the laws of supply and demand). If more traders want to go long than to go short, the price goes up; If the reverse is true, then the price goes down (Hull, 2005, p.6).

The fundamental difference between futures and forwards is the fact that futures are traded on exchanges. Forwards trade over the counter. This has three practical implications:

1. Futures are standardized instruments. We can only trade the specific contracts supported by the exchange. Forwards are entirely flexible. Because they are privately negotiated between parties, they can be for any conceivable underlier and for any settlement date. Parties to the contract decide on the notional amount and whether

physical or cash settlement will be used. If the underlier is for a physically settled commodity or energy, parties agree on issues such as delivery point and quality.

2. Forwards entail both market risk and credit risk. A counterparty may fail to perform on a forward. With futures, there is only market risk. This is because exchanges employ a system whereby counterparties exchange daily payments of profits or losses on the days they occur. Through these margin payments, a futures contract's market value is effectively reset to zero at the end of each trading day. This all but eliminates credit risk.

3. The daily cash flows associated with margining can skew futures prices, causing them to diverge from corresponding forward prices(www.riskglossary.com/articles/forward)

3.1.2.1 Currency Futures

A transferable futures contract that specifies the price at which a specified currency can be bought or sold at a future date. Currency future contracts allow investors to hedge against foreign exchange risk. Since these contracts are marked-to-market daily, investors can--by closing out their position--exit from their obligation to buy or sell the currency prior to the contract's delivery date (http://www.investopedia.com/terms/c/currencyfuture.asp).

The spot foreign exchange (forex or FX) market is the world's largest market, with over one trillion U.S. dollars traded per day. One derivative of this market is the forex futures market, which is only 1/100th the size (http://investopedia.com/terms/f/forex.asp).

Hedging and speculating are the two primary ways in which forex derivatives are used. Hedgers use forex futures to reduce or eliminate risk by insulating themselves against any future price movements. Speculators, on the other hand, want to incur risk in order to make a profit.

There are many reasons to use a hedging strategy in the forex futures market. One main purpose is to neutralize the effect of currency fluctuations on sales revenue. For example, if a business operating overseas wanted to know exactly how much revenue it will obtain (in U.S. dollars) from its European stores, it could purchase a futures contract in the amount of its projected net sales to eliminate currency fluctuations (http://www.investopedia.com/terms/c/currencyfuture.asp).

Forex futures operate similarly to traditional stock and commodity futures. There are many advantages to using them for hedging as well as speculating. The distinguishing feature of forex futures is that they are not traded on a centralized exchange. Forex futures can be used to hedge against currency fluctuations, but some traders use these instruments in pursuit of profit, just as they would use futures on the spot market (http://www.investopedia.com/articles/trading/04/102704.asp).

3.1.2.2 The Clearinghouse and Clearing Margin

The exchange clearinghouse is an adjunct of the exchange and acts as an intermediary in futures transactions. It guarantees the performance of the parties to each transaction. The clearinghouse has a number of members, who must post funds with the exchange. Brokers who are not members themselves must channel their business through a member. The main task of the clearinghouse is to keep track of all the transactions that take place during a day, so that it can calculate the net position of each of its members (Hull, 2005,p.29).

Just as an investor is required to maintain a margin account with a broker, a clearinghouse member is required to maintain a margin account with the clearinghouse. This is known as a clearing margin. The margin accounts for clearinghouse members are adjusted for gains and losses at the end of each trading day in the same way as are the margin accounts of investors (Hull,2005, p.29).

3.1.3 SWAP

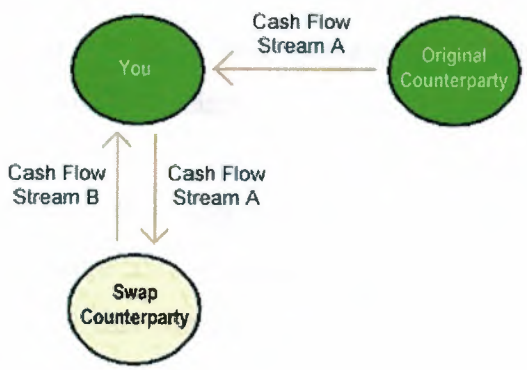
A **swap** is a cash-settled OTC derivative. Except for forwards, swaps are the most simple form of OTC derivative (http://www.riskglossary.com/articles/swap.htm).

A swap is an agreement between two counterparties to exchange two streams of cash flows—the parties "swap" the cash flow streams. Those cash flow streams can be defined in almost any manner. All that matters is that their present values be equal (except for a bid-ask spread, if one party to the swap is a dealer). While swaps are used for various purposes—from hedging to speculation—their fundamental purpose is to change the character of an asset or liability without liquidating that asset or liability.

For example, an investor realizing returns from an equity investment can swap those returns into less risky fixed income cash flows—without having to liquidate the equities. A corporation with floating rate debt can swap that debt into a fixed rate obligation—without having to retire and reissue debt (http://www.riskglossary.com/articles/swap.htm).

This is illustrated in (figure 3.1). Suppose we are receiving Cash Flow Stream A from a counterparty. We would like to change the nature of that cash flow stream—perhaps making it less risky. Rather than attempt to renegotiate the obligation with the counterparty, We enter into a swap agreement with another party. Under that agreement, we swap Cash Flow Stream A for a Cash Flow Stream B, which better suits our needs.

Figure 3.1-Cash Flow Stream in Swap



Source: (http://www.riskglossary.com)

By entering into a swap with a third party, we can convert a Cash Flow Stream A into a different Cash Flow Stream B. This does now require the liquidation or renegotiation of Cash Flow Stream A. Indeed, the counterparty paying you Cash Flow Stream A doesn't even need to know about the offsetting swap (http://www.riskglossary.com/articles/swap.htm).

The first currency swap contract, between the World Bank and IBM, dates to August of 1981 (Smithson, Charles W., Clifford W. Smith, Jr., and D. Sykes Wilford. 1995).

3.1.4 OPTIONS

An option is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset at a specific price on or before a certain date. An option, just like a stock or bond, is a security. It is also a binding contract with strictly defined terms and properties (http://www.investopedia.com/u/underlying.asp).

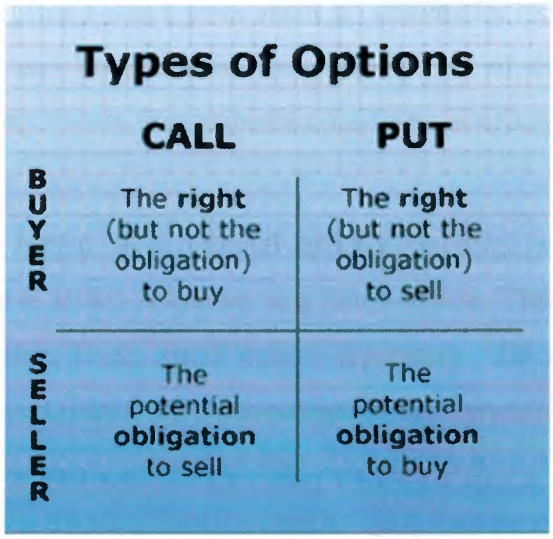
Options are traded both on exchange and in the over-the-counter market.(Hull,2005, p.605).

There are two basic types of option.

1-A **call** option gives the holder the right to buy an asset at a certain price within a specific period of time(Figure 3.2). Calls are similar to having a **long position** on a stock. Buyers of calls hope that the stock will increase substantially before the option expires (http://www.investopedia.com/c/call.asp).

2-A **put** option gives the holder the right to sell an asset at a certain price within a specific period of time(Figure 3.2). Puts are very similar to having a **short position** on a stock. Buyers of puts hope that the price of the stock will fall before the option expires (http://www.investopedia.com/p/put.asp).

Figure 3.2-Types of Options



Source:(http://www.cboe.com/LearnCenter/cboeeducation/Course_01_01/mod_01_01.aspx).

There are four types of participants in options markets depending on the position they take:

1. Buyers of calls
2. Sellers of calls
3. Buyers of puts
4. Sellers of puts

People who buy options are called holders and those who sell options are called writers; furthermore, buyers are said to have long positions, and sellers are said to have short positions (http://www.investopedia.com/terms/w/writer.asp).

There are important distinction between buyers and sellers:

- Call holders and put holders (buyers) are not obligated to buy or sell. They have the choice to exercise their rights if they choose. Call writers and put writers (sellers), however, are obligated to buy or sell. This means that a seller may be required to make good on a promise to buy or sell (http://www.investopedia.com/terms/w/writer.asp).

- The price at which an underlying stock can be purchased or sold is called the **strike price**. This is the price a stock price must go above (for calls) or go below (for puts) before a position can be exercised for a profit. All of this must occur before the expiration date (http.//www.investopedia.com/terms/s/strikeprice.asp).

- An option that is traded on a national options exchange such as the Chicago Board Options Exchange (CBOE) is known as a listed option. These have fixed strike prices and expiration dates. Each listed option represents 100 shares of company stock (known as a contract) (http.//www.investopedia.com/terms/c/cboe.asp).

For call options, the option is said to be **in-the-money** if the share price is above the strike price. A put option is in-the-money when the share price is below the strike price. The amount by which an option is in-the-money is referred to as intrinsic value.The total cost (the price) of an option is called the **premium**. This price is determined by factors including the stock price, strike price, time remaining until expiration (time value) and volatility. Because of all these factors, determining the premium of an option is complicated and beyond the scope of this tutorial (http.//www.riskglossary.com).

There are two main reasons why an investor would use options speculating and hedging.

Exercise style: Specifies when the option can be exercised;

- **American options** can be exercised at any time between the date of purchase and the expiration date.
- **European options** are different from American options in that they can only be exercised at the end of their lives (www.cboe.com).

The distinction between American and European options has nothing to do with geographic location.

3.1.4.1 Long-Term Options

There are also options with holding times of one, two or multiple years, which may be

more appealing for long-term investors.These options are called long-term equity anticipation securities (LEAPS). By providing opportunities to control and manage risk or even to speculate, LEAPS are virtually identical to regular options. LEAPS, however, provide these opportunities for much longer periods of time. Although they are not available on all stocks, LEAPS are available on most widely held issues (http.//www.investopedia.com/terms/l/leaps.asp).

3.1.4.2 How To Read An Options Table

Figure 3.3- Option Table

Stk	Exp	P/C	Vol	Bid	Ask	Opint
360networks (TSX)						20.15
20	Feb	C	3	1.00	1.25	26
22	Mar	C	10	1.60	1.85	138
24	Mar	C	2	1.05	1.25	366
18	June	P	2	2.50	2.75	11
20	June	C	12	4.05	4.30	83
24	June	C	1	2.65	2.90	77
Total option vol. 50				Total open int. 7,492		

Column 1 Column 2 Column 3 Column 4 Column 5 Column 6 Column 7

(http.//www.investopedia.com/terms/o/optiontable.asp).

In Figure 3 Option table ;

Column 1: Strike Price - This is the stated price per share for which an underlying stock may be purchased (for a call) or sold (for a put) upon the exercise of the option contract. Option strike prices typically move by increments of $2.50 or $5 (even though in the above example it moves in $2 increments).

Column 2: Expiry Date - This shows the termination date of an option contract.

Column 3: Call or Put - This column refers to whether the option is a call (C) or put (P).

Column 4: Volume - This indicates the total number of options contracts traded for the day. The total volume of all contracts is listed at the bottom of each table.

Column 5: Bid - This indicates the price someone is willing to pay for the options contract.

Column 6: Ask - This indicates the price at which someone is willing to sell an options contract.

Column 7: Open Interest - Open interest is the number of options contracts that are open; these are contracts that have neither expired nor been exercised (http.//www.investopedia.com).

There are some underlying assets of options, such as options on stock, currencies, futures, and stock indices.

3.1.4.3 Index Options

Index options are currently traded on the following U.S. exchanges: The American Stock Exchange LLC (AMEX), the Chicago Board Options Exchange, Inc. (CBOE), the International Securities Exchange (ISE), the Pacific Exchange, Inc. (PCX) and the Philadelphia Stock Exchange, Inc. (PHLX). Like as trading stocks, options trading is regulated by the Securities and Exchange Commission (SEC). These exchanges seek to provide competitive, liquid and orderly markets for the purchase and sale of standardized options. All option contracts traded on U.S. securities exchanges are issued, guaranteed and cleared by The Options Clearing Corporation (OCC). OCC is a registered clearing corporation with the SEC and has received a 'AAA' rating from Standard & Poor's Corporation. The 'AAA' rating relates to OCC's ability to fulfill its obligations as counterparty for options trades (http://www.cboe.com/Products/IndexOptions.aspx).

3.1.4.3.1 Benefits of Listed Index Options

Index options offer the investor an opportunity to either capitalize on an expected market move or to protect holdings in the underlying instruments. These indexes can reflect the characteristics of either the broad equity market as a whole or specific industry sectors within the marketplace (http://www.cboe.com/Products/IndexOptions.aspx).

Index options enable investors to gain exposure to the market as a whole or to specific segments of the market with one trading decision and frequently with one transaction. To obtain the same level of diversification using individual stock issues or individual equity option classes, numerous decisions and transactions would be required. Employing index options can defray both the costs and complexities of doing so.

Index options offer a known risk to buyers. An index option buyer absolutely cannot lose more than the price of the option premium.

Index options can provide leverage. This means an index option buyer can pay a relatively small premium for market exposure in relation to the contract value. An investor can see large percentage gains from relatively small, favorable percentage moves in the underlying index. If the index does not move as anticipated, the buyer's risk is limited to the premium paid. However, because of this leverage, a small adverse move in the market can result in a substantial or complete loss of the buyer's premium. Writers of index options can bear substantially greater risk if not unlimited (http://www.cboe.com/Products/IndexOptions).

An option holder is able to look to the system created by OCC's Rules and By-Laws (which includes the brokers and Clearing Members involved in a particular option transaction) and to certain funds held by OCC rather than to any particular option writer for performance. Prior to the existence of option exchanges and OCC, an option holder who wanted to exercise an option depended on the ethical and financial integrity of the writer or his brokerage firm for performance. Furthermore, there was no convenient means of closing out one's position prior to the expiration of the contract (http://www.theocc.com/publications).

3.1.4.3.2 Option Classes

Available strike prices, expiration months and the last trading day can vary with each index option class, a term for all option contracts of the same type (call or put) and style (American, European or Capped) that cover the same underlying index.

The strike price, or **exercise price**, of a cash-settled option is the basis for determining the amount of cash, if any, that the option holder is entitled to receive upon exercise (http://www.cboe.com/Products/IndexOptions.aspx).

An index call option is **in-the-money** when its strike price is less than the reported level of the underlying index. It is **at-the-money** when its strike price is the same as the level of that index and **out-of-the-money** when its strike price is greater than that level.

An index put option is **in-the-money** when its strike price is greater than the reported level of the underlying index. It is **at-the-money** when its strike price is the same as the level of that index and **out-of-the**-money when its strike price is less than that level.

Premiums for index options are quoted like those for equity options, in dollars and decimal amounts. An index option buyer will generally pay a total of the quoted premium amount multiplied by $100 for the contract. The writer, on the other hand, will receive and keep this amount (http://www.cboe.com/Products/IndexOptions.aspx).

The amount by which an index option is in-the-money is called its **intrinsic value**. Any amount of premium in excess of intrinsic value is called an option's time value. As with equity options, time value is affected by changes in volatility, time until expiration, interest rates and dividend amounts paid by the component securities of the underlying index.

The exercise settlement value is an index value used to calculate how much money will change hands, the exercise settlement amount, when a given index option is exercised, either before or at expiration. The value of every index underlying an option, including the exercise settlement value, is the value of the index as determined by the reporting authority designated by the market where the option is traded (http://www.cboe.com/Products).

The exercise settlement values of equity index options are determined by their reporting authorities in a variety of ways. The two most common are:

PM settlement - Exercise settlement values are based on the reported level of the index calculated with the last reported prices of the index's component stocks at the close of market hours on the day of exercise.

AM settlement - Exercise settlement values are based on the reported level of the index calculated with the opening prices of the index's component stocks on the day of exercise (http://www.cboe.com/Products/IndexOptions.aspx).

If a particular component security does not open for trading on the day the exercise settlement value is determined, the last reported price of that security is used (http://www.cboe.com/Products/IndexOptions.aspx).

Although equity option contracts generally have only American-style expirations, index options can have either American- or European-style.

In the case of an American-style option, the holder of the option has the right to exercise it on or at any time before its expiration date.

A European-style option is one that can only be exercised during a specified period of time prior to its expiration (http://www.cboe.com/Products/IndexOptions.aspx).

3.1.4.3.3 Options on the Dow Jones Industrial Average (DJIA)

With cash-settled options on the DJIA (trading symbol DJX) have tools for participating in the performance of 30 blue-chip stocks (30 blue-chip stocks shown in Appendix 2).

DJX is the symbol for options based on The Dow Jones Industrial Average^{SM} (DJIA^{SM}). The DJX index option contract is based on 1/100th (one-one-hundredth) of the current value of the Dow Jones Industrial Average. So, for example, when DJIA is at 11,000, the DJX level will be 110. The DJIA - the index on which the DJX contracts are based - is the oldest (established 1896) continuing U.S. market index, and the DJIA probably is the world's

best known stock index to individual investors. Options on the Dow are available from 8:30 a.m. to 3:15 p.m. (http://www.cboe.com/Products/Cash-SettledIndexOptions.aspx#dow).

Since their introduction in 1997, DJX options have grown to become some of the most popular index options worldwide, This popularity leads to four fundamental reasons for using DJX options:

1-Simplicity :Investors are able to trade a broad market by making one DJX trading decision rather than making the many decisions involved with investing in numerous individual stocks.

2- **Insurance** : DJX options offer a convenient and easy way to help reduce the market risk of a broad market portfolio, without disrupting the make-up of the portfolio.

3-Predetermined Risk: DJX option purchasers risk only the premium they pay for the option, plus commissions. The risk is both known and limited.

4-Leverage : Purchasing DJX options, instead of buying or selling numerous individual stocks, provides an investor with an additional opportunity to use investment capital elsewhere. For a relatively small percentage gain in the underlying index, a DJX option can increase in value by a multiple of that gain, assuming the correct option series was selected (http://www.cboe.com/Products/Cash-SettledIndexOptions.aspx#dow).

3.1.4.3.4 Basic Strategies on index options

The versatility of index options stems from the variety of strategies available to the investor.

- Buying Index Calls :This segment illustrates the possible outcome of buying calls to participate in market advances.
- Buying Index Puts :This segment illustrates the possible outcome of buying puts in anticipation of a market correction (http://www.cboe.com/Strategies/DefaultIndex).

3.1.4.3.4.1 Who Should Consider Buying Index Calls?

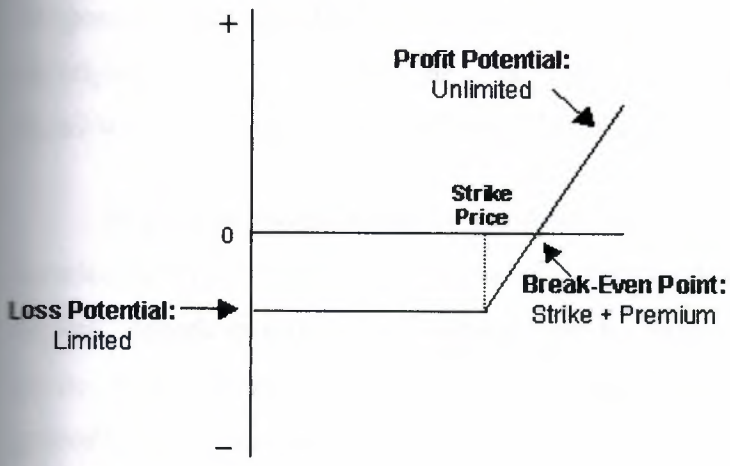
There are some reasons to buy index calls;

- An investor who is very bullish on a particular broad market or industry sector index, and wants to profit from a rise in its level.
- An investor who wants to diversify a portfolio, but may not be willing to commit the cash to an investment in a portfolio of multiple stocks.
- An investor who would like to take advantage of the leverage that options can provide, and with a limited dollar risk (http://www.cboe.com/Strategies/DefaultIndex.aspx).

Buying an index call is one of the simplest and most popular strategies used by option investors employing index options. It allows an investor the opportunity to profit from an upward move in the price of the underlying index, while having much less capital at risk than with the outright purchase of possibly scores of component issues (http://www.cboe.com/Strategies/DefaultIndex.aspx).

Buying an index call gives the owner the right, but not the obligation, to buy upon exercise the value of the underlying index at the stated exercise (strike) price before the option expires. American-style index options may be exercised at any time before the contracts expire. European-style index options may be exercised only within a specific period of time, generally on the last business day before expiration. However, any long index option may be sold in the marketplace on or before its last trading day if it has market value. All index options are cash-settled.This is a bullish strategy because the value of the call tends to increase as the level of the underlying index rises, and this gain will increasingly reflect a rise in the value of the underlying index when its level moves above the option's strike price. The profit potential for the long call is unlimited as the underlying index continues to rise. The financial risk is limited to the total premium paid for the option, no matter how low the underlying index declines. The break-even point is an underlying index level equal to the call's strike price plus the premium paid for the contract. As with any long option, an increase in volatility has a positive financial effect on the long call strategy while decreasing volatility has a negative effect. Time decay has a negative effect (Figure 3.4) .

Figure 3.4- Buying index calls



Volatility:
Increase = Positive Effect
Decrease = Negative Effect

Time Decay:
Negative Effect

Source: (http://www.cboe.com)

3.1.4.3.4.2 Who Should Consider Buying Index Puts?

There are some reasons to buy index puts;

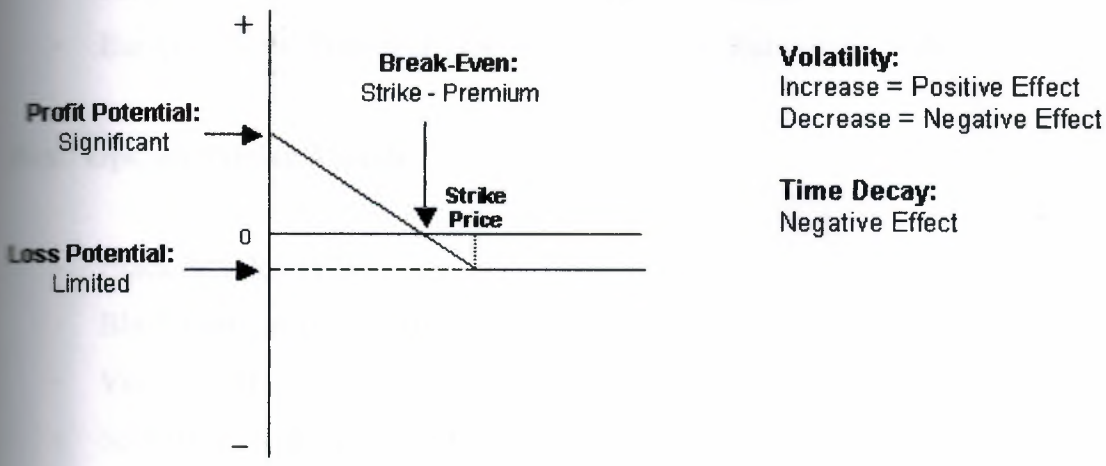
- An investor who is very bearish on a particular broad market or industry sector index and wants to profit from a decline in its level.
- An investor who would like to take advantage of the leverage that options can provide, and with a limited dollar risk.
- An investor who anticipates a decline in the value of a particular index but does not want the unlimited upside risk or the commitment of capital needed for a short sale of underlying shares (http://www.cboe.com/Strategies/DefaultIndex.aspx).

Buying an index put is one of the simplest and most popular bearish strategies used by investors employing index options. It allows an investor the opportunity to profit from a downward move in the price of the underlying index, while committing less capital compared to the potentially significant margin requirements needed for a short sale of numerous component issues. In addition, a long put holder is not subject to margin calls with increasing underlying index prices as is an investor with short stock positions (http://www.cboe.com/Strategies/DefaultIndex.aspx).

Buying an index put gives the owner the right, but not the obligation, to sell upon exercise the value of the underlying index at the stated exercise (strike) price before the option expires. American-style index options may be exercised at any time before the contracts expire. European-style index options may be exercised only within a specific period of time, generally on the last business day before expiration. However, any long index option may be sold in the marketplace on or before its last trading day if it has market value. All index options are cash-settled. This is a bearish strategy because the value of the put tends to increase as the level of the underlying index declines, and this gain in option value will increasingly reflect a decline in the level of the underlying index when its level moves below the option's strike price. The profit potential is significant as the level of the underlying index continues to decline, and is limited only by a potential decrease in that level to no less than zero. The financial risk is limited to the total premium paid for the option, no matter how high the underlying index increases. Many investors find this limited risk more attractive than the

unlimited upside risk incurred from a short sale of component stocks. In addition, a short seller of shares must pay any dividends distributed to shareholders while the short position is held; a put holder does not. The break-even point is an underlying index level equal to the put's strike price minus the premium paid for the contract. As with any long option, an increase in volatility has a positive financial effect on the long put strategy while decreasing volatility has a negative effect. Time decay has a negative effect (Figure 3.5).

Figure 3.5- Buying index puts



Source: (http://www.cboe.com)

3.1.4.4 Options Pricing

3.1.4.4.1 Option Pricing Models

A great deal of pricing models are developed according to structural characteristics of underlying assets, conditions date of exercise and characteristics of the markets.

Currency Options Pricing Models:

- American Type: Barone Adesi & Whaleys-Quadratic Aproximation-1987
- European Type: German & Kohlhagen-1983
- American Type: Binomial Tree–Cox & Ross & Rubinstein-1979
- European Type: Binomial Tree – Cox & Ross & Rubinstein-1979

Bond Options Pricing Models:

- Black-Scholes-1973
- Black Derman Toy-1990
- Vasicek-1977
- Schaefer & Schwartz-1987
- Rendleman & Bartter-1980 (www.riskactive.com).

3.1.4.4.2 The Black & Scholes Option Pricing Model

Fischer Black & Myron Scholes are two economist, who in 1973 published a paper which redefined finance and derivatives, with "The Pricing of Options & Corporate Liabilities" featured in the Journal of Political Economy in May of that year. The piece is arguably one of the most important papers within finance theory to date and allows us to price various derivatives, including options on commodities, financial assets and even pricing. It has also been pivotal the growth and success of financial engineering in the last 20 years. In 1997, the importance of the model was recognized when robert Merton and Myron Scholes

were awarded the Nobel prize for economics. Black had died in 1995, but otherwise would have shared the prize (http://www.cboe.com/LearnCenter/cboeeducation/Course_01_04).

3.1.4.4.2.1 Components of Option Pricing

Different components which are used to determine the theoretical value of an option: The price of the underlying stock The strike price of the option The time until the option expires The cost of money (interest rates less dividends, if any) The volatility of the underlyingstock(http://www.cboe.com/LearnCenter/cboeeducation/Course_01_04/mod_04_0 1.aspxof employee stock options).

The Assumptions Underlying the Model

1. No dividends are paid out on the underlying stock during the option life.

2. The option can only be exercised at expiry (European characteristics)

3. Efficient markets (Market movements cannot be predicted)

4. Commissions are non-existent

5. Interest rates do not change over the life of the option (and are known)

6. Stock returns follow a lognormal distribution (http://www.cboe.com/LearnCenter).

The Model (Non-Dividend)

The basic inputs to price a European option on a non-dividend paying stock is as follows:

S = Underlying stock price

X = Strike price

r = Risk free rate of interest

V = Volatility

T-t = Time to maturity

We can then apply these input variables into the following set of equations to derive the price for a European call option on a non-dividend stock:

$$c_t = SN(d_1) - Xe^{-r(T-t)}N(d_2)$$

And for a European put option on a non-dividend stock:

$$p_t = Xe^{-r(T-t)}N(-d_2) - SN(-d_1)$$

Where N(d1) and N(d2) are the cumulative normal distribution functions for d1 and d2, which are defined as:

$$d_1 = \frac{\ln(\frac{S_t}{X}) + (r + 0.5\sigma^2)(T-t)}{\sigma\sqrt{T-t}}$$

$$d_2 = \frac{\ln(\frac{S_t}{X}) + (r - 0.5\sigma^2)(T-t)}{\sigma\sqrt{T-t}}$$

d2 can be further simplified as:

$$d_2 = d_1 - \sigma\sqrt{T-t}$$

By means of substitution.

In order to compute the cumulative normal distribution function, we can consider the partial derivative of N(x).

$$N(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{\frac{-z^2}{2}} dz$$

We then apply the terms d_1 and d_2 to the equation and we obtain the solutions to the terms (as defined above).

The Model (Dividend Paying) - Merton (1973)

For a dividend paying stock, we can alter the standard Black-Scholes model to incorporate an annual dividend yield (extended by Merton in 1973) and include the term "d" (no-subscript) as being the dividend yield per year.

The value of a call option can be calculated as:

$$c_t = Se^{-d(T-t)}N(d_1) - Xe^{-r(T-t)}N(d_2)$$

Where d1 and d2 equals:

$$d_1 = \frac{\ln(\frac{S_t}{X}) + (r - d + 0.5\sigma^2)(T-t)}{\sigma\sqrt{T-t}}$$

$$d_2 = \frac{\ln(\frac{S_t}{X}) + (r - d - 0.5\sigma^2)(T-t)}{\sigma\sqrt{T-t}}$$

And similarly, the non-dividend version of the model, we can simplify d2 as being:

$$d_2 = d_1 - \sigma\sqrt{T-t}$$

The value of a put can be calculated using the put-call parity (for non dividend paying options):

$$p_t = c_t - S_t + Xe^{-r(T-t)}$$

or for dividend paying options:

$$p_t = c_t - S_t e^{-d(T-t)} + Xe^{-r(T-t)}$$

Or with the full formula:

$$p_t = Xe^{-r(T-t)} N(-d_2) - Se^{-d(T-t)} N(-d_1)$$

the formulas are taken from the web side;

(http://www.cboe.com/LearnCenter/cboeeducation/Course_01_04/mod_04_01.aspxof employee stock options).

CHAPTER 4 DERIVATIVE MARKETS IN TURKEY

4.1 Introduction

The first derivative market transaction application in Turkey, began with the gold oriented future contracts in Istanbul Gold Stock Exchange. Istanbul Gold Stock Exchange future Transactions and Option Market was activated in the 15th of August in 1997 within the framework of Stock Exchange. It was done in accordance with: as required by 2488 numbered Capital Market Law's (j) article and also in accordance with the 'Istanbul Gold Stock Exchange Future Transaction and Option Market Regulations' which was published in the Official Gazette(the date of the gazette and the issue number is: 18/10.1996-22791 no). In Istanbul Gold Stock Exchange Future Transactions and Option Market, there are two different gold future contracts which are 100 ounce and 1 kg (www.iab.gov.tr, 05.05.2005).

Istanbul Securities and Stock Exchange Future Transactions Market Management (which was established on the 3rd of May in 1994) activated Istanbul Securities and Stock Exchange Future Market by starting TRY/USD futures transaction contract in the stock exchange atmosphere on the 15th of August in 2001. At the end of 2003, by taking the stability and volatility into consideration decrease during the whole year in the market, the

guarantees were decreased and TRY/EURO futures contracts were began to used (www.imkb.gov.tr, 09.12.2004).

According to the article 40 of Capital Market Law, Izmir Future Transaction and Option Stock Exchange (TURKDEX) was established in the 39/859 numbered meeting of Capital Market Committee Decision Organ in the 27th of June in 1995. This was published in the 22352 numbered Official Gazette in the 23rd of July in 1995.

In the 4th of February in 2005, Izmir Future Transaction and Option Stock Exchange which is the Turkey's first derivative transactions stock exchange, began to act. In this stock exchange there are some future contracts and these are: Aegean standard 1 base quality cotton, Anatolian red hard wheat, TRY/USD exchange rate, TRY/EURO exchange rate, future contracts treasury bond interest rate of 91 days, future contracts treasury bond interest rate of 365 days and Istanbul Securities Stock Exchange 30 index (Akcan, 2002; www.vob.org.tr, 16.05.2005).

4.2 TURKISH DERIVATIVES EXCHANGE

TURKDEX is the first private exchange in Turkey. TURKDEX, started its operation right after the company was registered in Registry of Commerce. This registration was officially announced through the Gazette of Registry of Commerce, dated July 4, 2001 (http://www.vob.org.tr/VOBPortalTur/DesctopDefault.aspx.).

4.2.1 "TurkDEX-TRYUSDollar" Futures Position Limits

There are two kinds of position limits for contracts listed at TURKDEX: Absolute and Percentage Limits. Absolute limit is determined as the number of open interest for each contract month that one account might hold. The absolute limit for each contract is 20,000. If the number of open interest pass over 20,000 then the system checks the percentage limit which is 10% of total open interest for the related contract month (http://www.turkdex.org.tr).

4.2.2 Share holders of TURKDEX

Table 4.1 Share holders of TURKDEX

▪ **The Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey**, is the greatest representative of business environment with chambers and exchanges more than 350 and with members more than 1 million.
▪ **Izmir Mercantile Exchange**, is the institution, taking a leading role in the establishment of Turkdex, with a background of experience and knowledge going beyond a century.
▪ **Istanbul Stock Exchange (ISE)**, is an internationally well known stock exchange of Turkey.
▪ **Is Investment Securities**, is a subsidiary of Is Bank which is one of the most reputable and financially solid banks of Turkey.
▪ **Kocbank**, is one of the most reputable and financially solid banks of Turkey.
▪ **Vakif Investment Securities**, is a subsdiary of Vakifbank which is one of the public-owned and financially solid banks of Turkey.
▪ **Garantibank**, is one of the most reputable and financially solid banks of Turkey.
▪ **Akbank**, is one of the most reputable and financially solid banks of Turkey
▪ **Industrial Development Bank of Turkey**, is the bank financing medium and long-term investments and it is owned by a consortium of well known banks of Turkey .
• **ISE Settlement and Custody Bank**, is the institution that is in charge of realizing clearing transactions and custodian services for brokerage houses and banks that are

authorized for capital market operations.

- **The Association of Capital Market Intermediary Institutions of Turkey** is a public organization which aims to contribute to development of the capital market and intermediation activities.

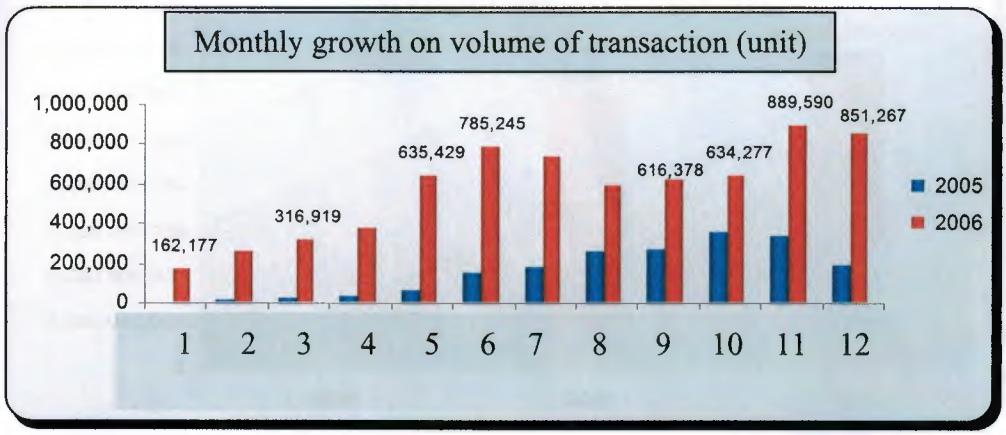
Source:(http://www.vob.org.tr/VOBPortalTur/DesktopDefault.aspx?tabid=233).

4.3 Some indicators about trading volumes of future exchange

Futures and options exchanges are one of the main institutions of liberal economic systems. Although negative developments hurt the financial markets in recent years, trading volumes of futures exchanges have continued to increase during that period, and following figures indicate that some important values.

When volume of transaction in 2006 compared to 2005, the total trading volume in terms of unit has increased by %274 which is a rise from 1.832.871 units to 6.848.087 (Figure 4.1).

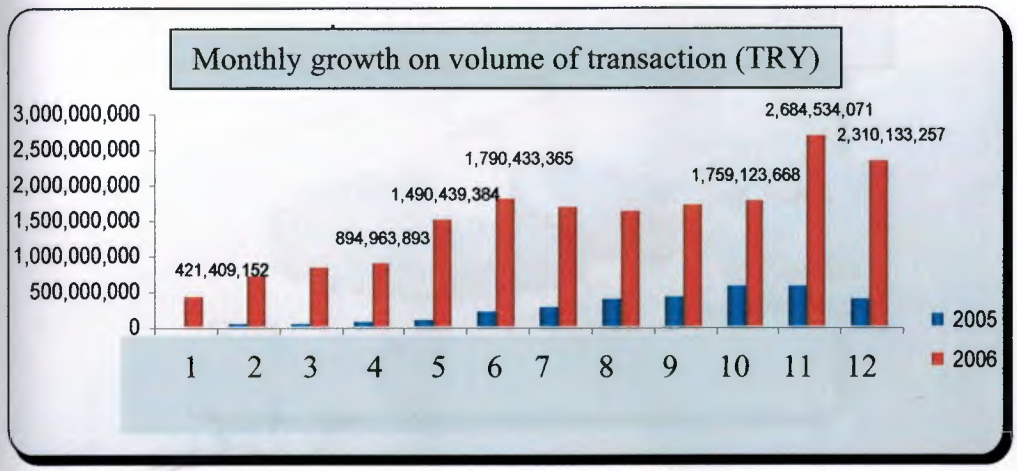
Figure 4.1 Monthly growth on volume of transaction (unit)



Source:http://www.turkdex.org.tr/VOBPortalEng/DesktopDefault.aspx

When volume of transaction in 2006 compared to 2005, the total trading volume in terms of TRY has increased by %490 which is a rise from 3.029.588.946 TRY to 17.876.421.270 TRY (Figure 4.2).

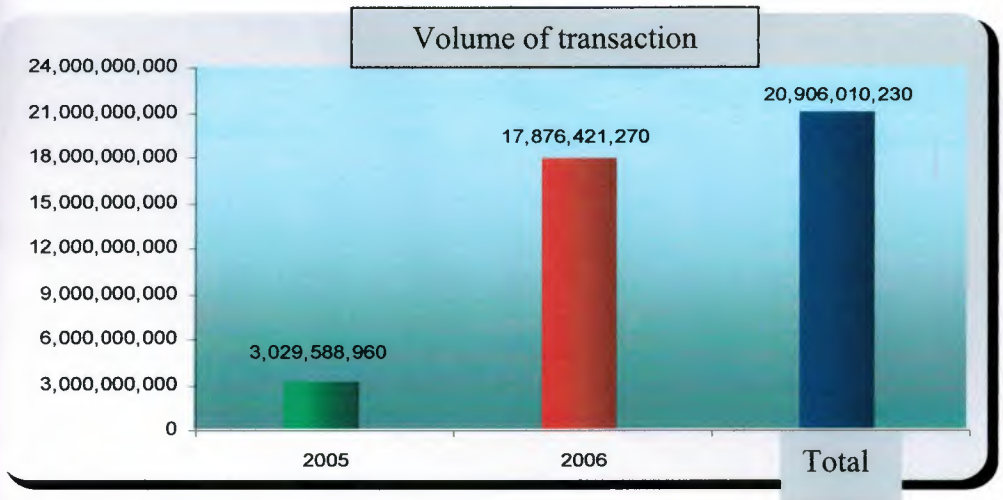
Figure 4.2 Monthly growth on volume of transaction (TRY)



Source:http://www.turkdex.org.tr/VOBPortalEng/DesktopDefault.aspx

The volume of transaction in 2006 is 6 times more than 2005 (Figure 4.3).

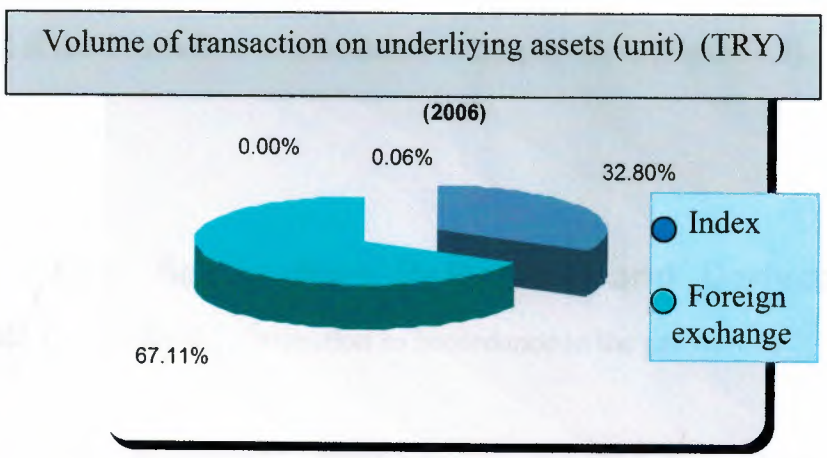
Figure 4.3 Volume of transaction



Source:http://www.turkdex.org.tr/VOBPortalEng/DesktopDefault.aspx

Foreign currency contract composes the biggest part of the trading volume by %91 in terms of unit whereas in 2006. Foreign currency contract makes up %67 of the trading volume in terms of units and it is the biggest part of it as well (Figure 4.4).

Figure 4.4 Volume of transaction on underliying assets (unit) (TRY)



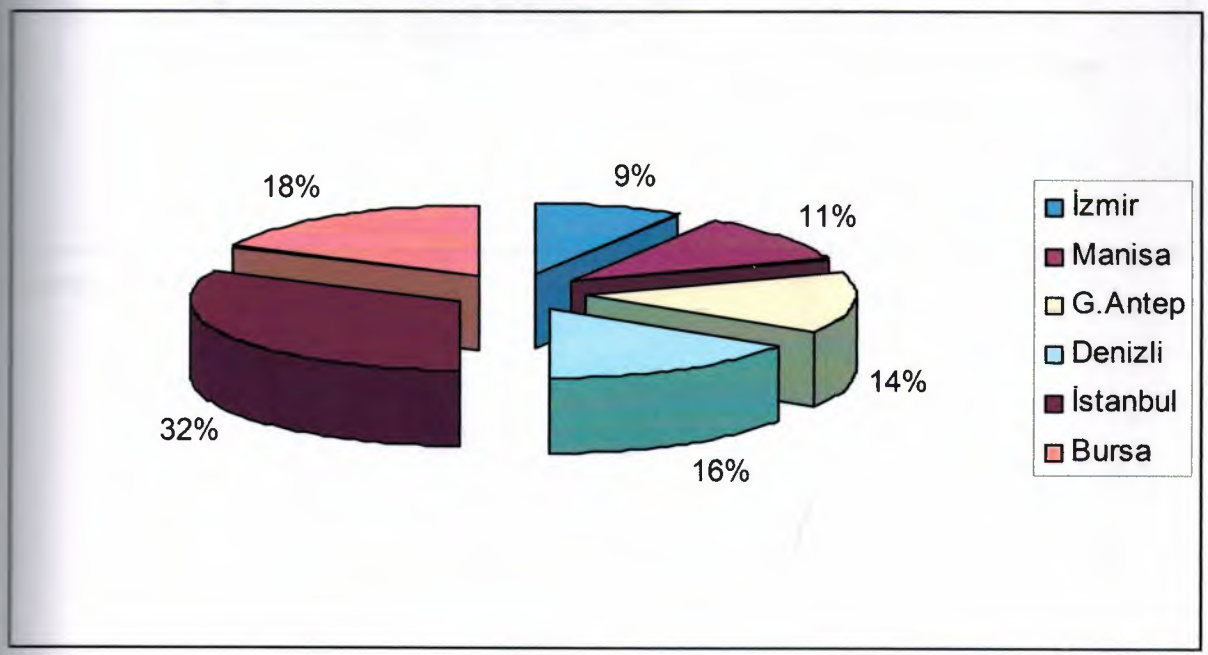
Source:http://www.turkdex.org.tr/VOBPortalEng/DesktopDefault.aspx) (2006 Yearly Stock Exchange Datas).

4.4 Some indicators about currency risk

The following figures shows to better understand importance of exchange rate risk.

Real Sector Risk Perception and Derivation Product Usage Poll in Turkey Profile of the participants: This research has been conducted in 103 firms in total, and most of firms are from Istanbul at the distribution in accordance to the provinces (Figure 4.5).

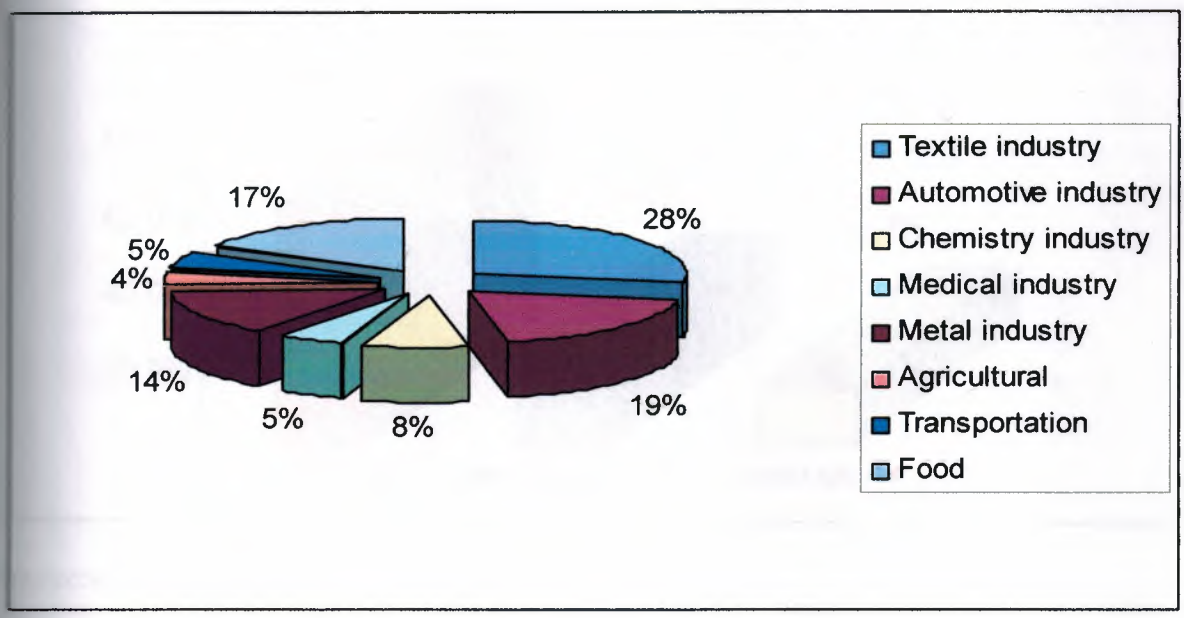
Figure 4.5 Real Sector Risk Perception and Derivation Product Usage poll in Turkey (distribution in accordance to the provinces)



Source:www.riskactive.com

At the distribution in accordance to the sectoral, the textile industry sector has more percentage than others; reason of this can be show it would be related export dealing with future exchange (Figure 4.6).

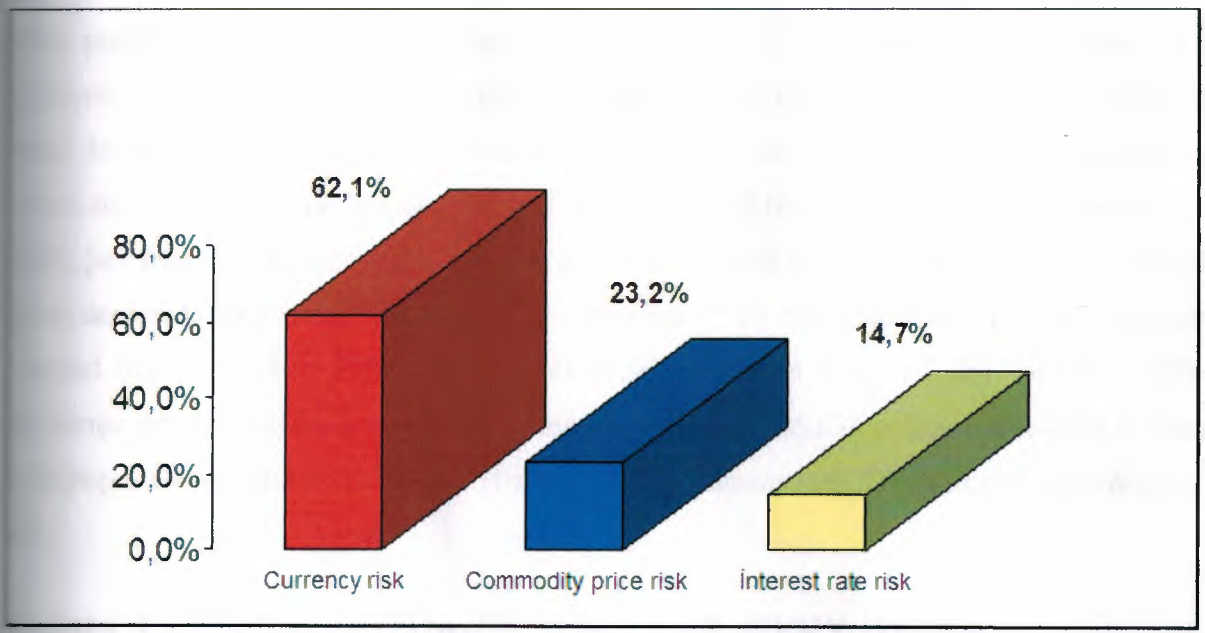
Figure 4.6 Real Sector Risk Perception and Derivation Product Usage poll in Turkey (distribution in accordance to the sectoral)



Source:www.riskactive.com

According to first degree risk perception of 103 firms in turkey, currency risk has more percentage than others (Figure 4.7).

Figure 4.7 103 Firms First Degree Risk Perception in Turkey

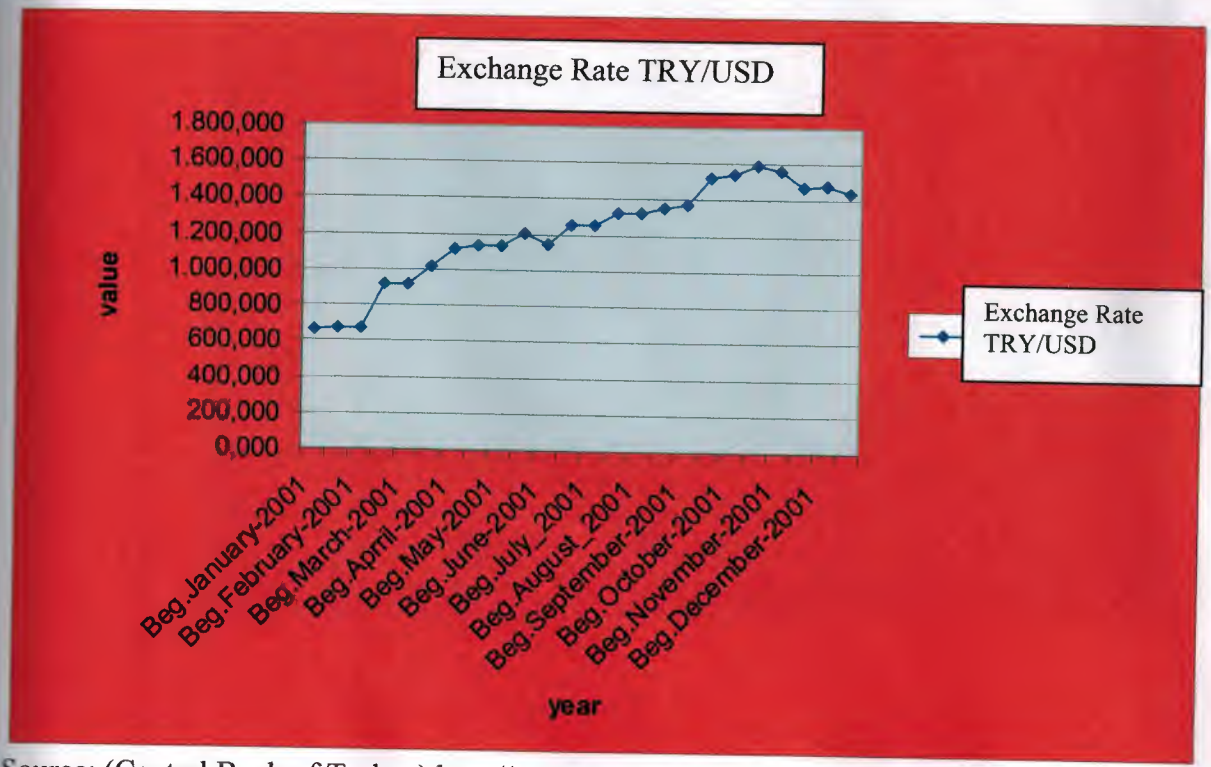


Source:www.riskactive.com

4.5 Exchance Rate-TRY/USD in 2001 in TURKEY

In February 1990, Turkey applied to the IMF for the full convertibility of the lira. Up to January 2000, managed floating exchange rate system was operative. At the end of 1999, Turkey signed a stand-by agreement with the IMF and started to implement a stabilization program one of the pillars of which was a pre-announced crawling peg exchange rate regime. The novelty of this exchange rate regime was that both the exit strategy and the date of exit were publicly known at the very beginning of the program: It was announced that, after eighteen months, exchange rate would be allowed to fluctuate in a continuously widening band. However, after a sky-high overnight rate as much as 6200 percent in uncompounded terms and a huge decline in foreign exchange reserves of the Central Bank, on February 23, 2001, just four months before the exit day, the exchange rate system collapsed and the Central Bank declared that it would allow the lira to float freely. By this announcement, the dollar rate jumped from a level of 685 thousand liras to 958 thousand liras in a day. and TRY/USD exchange rate jumped from 666,774 in January-2001 to 1.446,638 in December-2001 (Figure 4.8)(http://www.econ.brown.edu/fac/Herschel_Grossman/courses/122readings/Ozatay&Sak.pdf).

Figure 4.8 Exchance Rate-TRY/USD in TURKEY (2001)



Source: (Central Bank of Turkey) http://www.tcmb.gov.t

This is a sample of bloomberg screen which is taken from the computer shows the USD/TRY volatility. Its seen above the exchange rate is very volatile between the period 2001-2005 (Figure 4.9).

Figure 4.9 Graph of exchange rate risk in floating exchange rate USD/TRY

Source: http://www.bloomberg.com/

4.6 Future Contracts of TRYUS Dollar exchange rate

Finally, according to all of these indicators, we can understand that exchange rate risk is a very important issue for many people. Individuals, firms or financial institutions may use the TRYUSDollar future contract to hedge themselves against the exchange rate volatility.

- If we are an **exporter,** by using this contract we will be able to fix our receivables in TRY and will be able to give price quotations to our customers for longer periods.
- On the other hand, If we are an **importer**, we will be able to fix our future payments in TRY and will be able to take future purchasing decisions without facing any currency fluctuation risk (http://www.turkdex.org.tr/VOBPortalEng).

TRYUSDollar contract might also be used for **investment** purposes other than hedging. It is a new and alternative investment product which offers new opportunities for investors with its leverage effect (http://www.turkdex.org.tr/VOBPortalEng).

CHAPTER 5 PRICING FUTURES AND OPTIONS

5.1 Application of Option pricing on Dow Jones Industrial Average (^DJX) by using Black_Scholes option pricing model.

In this section, we used the Black&Scholes european call option pricing model to find theoretical price of option on Dow Jones Industrial Average Index, we take period between 06-02-2007 and 16-02-2007 of 10 days, necessary variables which is date of 06-02-2007 are used to find theoretical value of one european call option on Dow Jones Industrial Average Index whish is related term of 16-02-2007. As aresult we make a comparison between market value and theoretical value of index for making decision.

If the current stock certificate 'S', which is present in the original of the model of Black & Scholes, changed into S, Se^{-qT} it can be used in pricing the model and stock exchange index options. In this new situation, S represents the current index value whereas q represents the profit share ratio which is provided upon index. By taking these changes into consideration, the formulas related with the pricing of European call option can be arranged as below (Blake, David).

Formulas are:

$$C = Se^{-qT} N(d1) - Xe^{-rT} N(d2)$$

$$d1 = \frac{\ln(S/X)+(r-q+\sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d2 = \frac{\ln(S/X)+(r-q-\sigma^2/2)T}{\sigma\sqrt{T}} = d1 - \sigma\sqrt{T}$$

5.1.1 European Call Option on Dow Jones Industrial Average(^DJX)

- Today is 06-02-2007
- Last Trade Day/Expiration Date : Fri, Feb 16, 2007 T= 0,027 (Appendix 9.)
- The Current Value of the index :S= 126.62 (Table 5.1)
- The exercises/strike price:X= 115.00 (Table 5.2)
- The risk free interest rate: r = 5,11 % per annum (www.federalreserve.gov/releases/cp/).
- Volatility of the index= 8,48% per annum (Appendix 4.)
- Dividend q =2,39% per annum (Appendix 4.)

Table 5.1 1/100 DOW JONES INDUSTRIAL AVER (Chicago Options:^DJX) Delayed quote data

Index Value:	**126.62**
Trade Time:	Feb 5
Change:	**0.00 (0.00%)**
Prev Close:	126.62
Open:	126.53
Day's Range:	126.30 - 126.81
52wk Range:	Not available

Source:finance.yahoo.com/q/op?s=%5EDJX

Table 5.2 CALL OPTIONS Expire at close Fri, Feb 16, 2007

Strike price	Symbol	Call premium
110.00	^DJX	15.70
111.00	^DJX	14.60
112.00	^DJX	13.60
113.00	^DJX	12.60
114.00	^DJX	11.20
115.00	**^DJX**	**10.00**
116.00	^DJX	9.00
117.00	^DJX	9.40
118.00	^DJX	7.16
119.00	^DJX	6.70
120.00	^DJX	5.10
121.00	^DJX	5.50
122.00	^DJX	4.70
123.00	^DJX	3.70
124.00	^DJX	2.85
125.00	^DJX	1.90
126.00	^DJX	1.15

Source:finance.yahoo.com/q/op?s=%5EDJX

In this case, S=126.62, X=115.00, r=0,0511 , σ=0,0848 , T= $\frac{10 \text{ days}}{360}$ = 0,027 q= 0,0239

$$d1 = \frac{\ln(S/X)+(r-q+\sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d1 = \frac{\ln(126.62/115.00)+(0,0511-0,0239+(0,0848)^2/2)*0,027}{0,0848\ \sqrt{0,027}}$$

$$d1 = \frac{\ln(1.101043478)+(0,0272+(0,00359552)*0,027}{0,013934061}$$

$$d1 = \frac{0.096258346 + 0,00083147904}{0,013934061}$$

$$d1 = \frac{0.097089825}{0,013934061}$$

d1= 6.9678

$$d2 = \frac{\ln(S/X)+(r-q-\sigma^2/2)T}{\sigma\sqrt{T}} = d1 - \sigma\sqrt{T}$$

$$d2 = \frac{\ln(126.62/115)+(0,0511-0,0239-(0,0848)^2/2)*0,027}{0,0848\ \sqrt{0,027}}$$

$$d2 = \frac{\ln(1.101043478)+(0,00054024192)}{0,013934061}$$

$$d2 = \frac{0.096258346 +0,00054024192}{0,013934061}$$

d2= 6.9469

and now,we must calculate d1=6.9678 and d2=6.9469 values using with table of N(d1) and N(d2). To calculate N(x) we used to table which is shown in (Appendix 9).

N(d1)= N(6.9678)= N(6.96)+0.78 [N(0.97)-N(0.96)]

1+0.78 [(0.8340)-(0.8315)]

=1+0,00195 =1.00195

hence, **N(d1)= 1.00195**

N(d2)= N(6.9469)=N(6.94)+0.69*[N(0.95)-N(0.94)]

1+0.69*[0.8289-0.8264]

=1.001725

hence,**N(d2)= 1.001725**

$C = Se^{-qT} N(d1) - Xe^{-rT} N(d2)$

So that the call price C is given by equation as

$C = 126.62*1.00195\ e^{-0,0239*0,027} - 115*1.001725\ e^{-0,0511*0,027}$

$C = 126.62*1.00195\ e^{-0,0006453} - 115*1.001725\ e^{-0,0013797}$

C=126.62*1.00195*0.999354908 – 115*1.001725*0.998621251

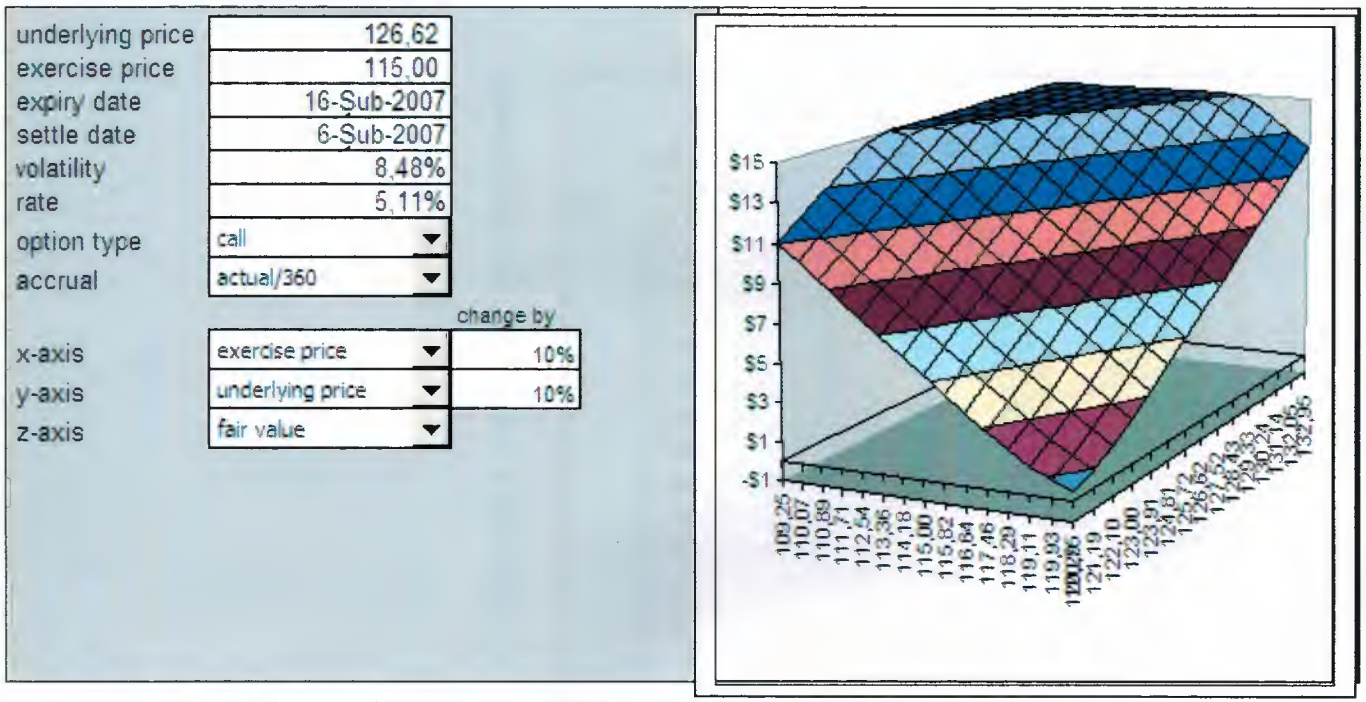
C=126.7850682- 115.0395454

C= 11.74

So one european call option price is $11.74 which is written on Dow Jones Industrial Avrage Index.

To proof this result I used Black & Scholes Option Pricing Model-3D simulator, and according to simulator, result is same (Figure 5.1).

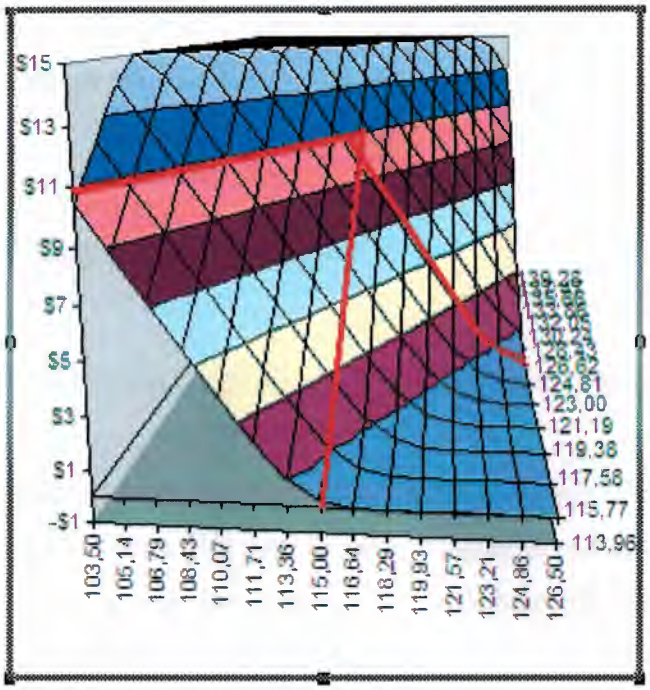
Figure 5.1-BLACK & SCHOLES OPTION MODEL-3D SIMULATOR -1



Source: FINCAD XL, Version 10.0.0.502

When we enter input variables to Black&Scholes option model-3D simulator that shows one european call option price is about $ 11 which is shown in the following figure 5.2.

Figure 5.2-BLACK & SCHOLES OPTION MODEL-3D SIMULATOR-2



Source: FINCAD XL, Version 10.0.0.502

Hence, one european call option contract price which is written on stock index is **$ 11.74,**
After we found call option with using black-scholes model, we look to call option which is determined by the market in spot.

According to **1/100 DOW JONES INDUSTRIAL AVER** (Chicago Options:^DJX) Delayed quote data call premium is 10.00 at strike 115 (Table 5.2).
So call option is currently selling for $10.00 we should consider buying some of them because they are **underpriced according to Black-Scholes model** and can be expected to rise in value in the future.

5.1.1.1 Strategy : Buying Index Calls

Goal: Positioning to profit from an increase in the level of the underlying index

We are anticipating an advance in the broad market or market sector measured by the underlying index in the near future. We want to take an aggressive position that can provide a great deal of leverage. This decision is made with the understanding that there is a possibility we may lose the entire premium we pay for the option.

An index call option gives the purchaser the right to participate in underlying index gains above a predetermined strike price until the option expires. The purchaser of an index call option has unlimited profit potential tied to the strength of advances in the underlying index.

Scenario

The underlying index that interests it is symbolized as DJIA and is currently at a level of 12,661.74 (Table 5.3), DJX is based on 1/100th of the DJIA, so the options index value would be at 126.62. We decide to purchase a 10-days DJX 115 call for a quoted price of $10 per contract. Our net cost for this call is $1000 ($10 x 100 multiplier). We are risking $1000 if the underlying index level is not above the strike price of 115 when the DJX call expires. The break-even point (BEP) at expiration is an DJX index level of 125 (strike price 115 +

premium paid $10) because the call will be worth its intrinsic value of $10, which is what we originally paid for it. The higher the DJX index settlement value is above the break-even point at expiration, the greater our profit (Figure 5.3)

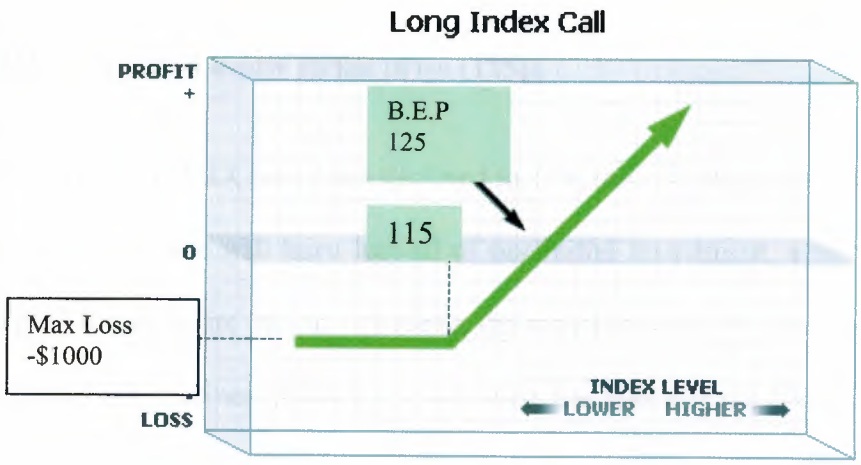
Table 5.3 DOW JONES INDUSTRIAL AVERAGE IN (DJI:^DJI)

Delayed quote data

Index Value:	**12,661.74**
Trade Time:	Feb 5
Change:	↑8.25 (0.07%)
Prev Close:	12,653.49
Open:	12,653.41
Day's Range:	12629.86 - 12681.21
52wk Range:	10,653.20 - 12,741.30

Source:http://finance.yahoo.com/q?s=%5EDJI

Figure 5.3 GRAPH OF INDEX LEVEL OF ^DJX.



The X-axis represents the price level of an underlying stock. The Y-axis represents profit and loss, above and below the X-axis intersection respectively.

5.1.1.2 Possible Outcomes at Expiration

1. **DJX index level above the break-even point (125):**

If at expiration DJX index has advanced to 136, the DJX 115 call will be worth its intrinsic value of $21 (settlement value 136 - strike price 115). Our net profit in this case would be $1100 (settlement amount $ 2100 received from exercise - net cost of call $1000) (Table 5.4).

2. **DJX index level between strike price (115) and break-even point (125):**

If at expiration DJX index at 124, the DJX 115 call will be worth its intrinsic value of $9 (settlement value 124 - strike price 115). We could exercise the option and receive the settlement amount of $1000 ($10 intrinsic value x 100 multiplier). This amount would be less than the net amount paid for the call ($1000), but it would offset some of that cost. The net loss in this case would be $100 (net cost of call $1000 - settlement amount $900 received from exercise). This loss represents a little more than half of our initial investment(Table 5.4).

3. **DJX index level below strike price (115):**

If at expiration DJX index has declined to 114, the call would have no value because it is out-of-the-money. We will have lost all of our initial investment, a net of $1000. The net premium paid for an index option represents the maximum loss for an option purchaser. No matter how far DJX declines below the strike price, the loss will not exceed $1000(Table 5.4).

Table 5.4 Buy DJX Index 115 Call at $10 with Index at 126.62

Buy DJX Index 115 Call at $10 with Index at 126.62 Net Cost for Call = $1,000			
Level of DJX Index at expiration	DJX Index Declines to 114 (below strike)	DJX Index at 124 (between strike and BEP)	DJX Index Advances to 136 (above BEP)
Move in level of index	down 12.62 pts.	down 2.62 pts.	up 9.38 pts.
Value of call at expiration (per contract)	0 (out-of-the-money)	$9	$21
Less premium paid for call	$10	$10	$10
Net profit/loss* (per contract x 100)	–$1000	-$100	$1100

*Exclusive of commissions, transaction costs and taxes.

And when the date of maturity (16-02-2007) came, I looked to index level of Dow Jones Industrial Average, I saw that index level reached to 12,767.57, and we know that DJX is based on 1/100th of the DJIA, so the options index value would be at 127.68. These indicators show that our expectation is true according to our calculation of pricing european call option on Dow Jones Industrial Average Index (Figure 5.4).

According to this **DJX index level is above the break-even point (125):**

DJX index has advanced to 127.68, the DJX 115 call will be worth its intrinsic value of $12.68 (settlement value 127.68 - strike price 115). Our net profit in this case would be $268 (settlement amount $ 1,268 received from exercise - net cost of call $1000).

Figure 5.4 1/100 Dow Jones Industrial Average(^DJX) Summary News

DOW JONES INDUSTRIAL AVERAGE IN (DJI:^DJI)		1/100 DOW JONES INDUSTRIAL AVER	
Index Value:	12,767.57	Index Value:	127.68
Trade Time:	4:03PM ET	Trade Time:	4:30PM ET
Change:	↑ 2.56 (0.02%)	Change:	↑ 0.03 (0.02%)
Prev Close:	12,765.01	Prev Close:	127.65
Open:	12,764.13	Open:	127.64
Day's Range:	12,744.02 - 12,769.17	Day's Range:	127.44 - 127.69
52wk Range:	10,653.20 - 12,828.40	52wk Range:	N/A

Source:finance.yahoo.com/q/op?s=%5EDJX

Table 5.5 Product Specifications of ^DJX

Options Based on Dow Jones Industrial Average (DJX)

Symbol:	DJX
Index Description:	The Dow Jones Industrial Average is a price-weighted index composed of 30 of the largest, most liquid NYSE and NASDAQ listed stocks.
Underlying:	Options are based on 1/100th of the DJIA^{SM} level.
Index Componeultiplier:	$100.
Premium Quote:	Stated in decimals. One point equals $100. Minimum tick for options trading below 3.00 is 0.05 ($5.00) and for all other series, 0.10 ($10.00).
Strike Prices:	Strike prices for options are set to bracket the index level in minimum increments of 1 point.
Expiration Cycle:	Generally, up to three near-term months plus up to 3 months on the March quarterly cycle.
Expiration Date:	Saturday following the third Friday of the expiration month.
Exercise Style:	European.
Last Trading Day:	Trading in DJX will ordinarily cease on the business day (usually a Thursday) preceding the day on which the exercise-settlement value is calculated.
Settlement Type:	Cash-settled.
Settlement Value:	Calculated based on the opening prices of the component securities on the business day prior to expiration, usually a Friday. The exercise-settlement amount is equal to the difference between exercise-settlement value and the exercise price of the option, multiplied by $100.
Settlement Value Symbol:	DJS
Position and Exercise Limits:	No position and exercise limits are in effect. Each member (other than a market-maker) or member organization that maintains an end of day position in excess of 1 million contracts in DJX (DJX and DJX LEAPS) for its proprietary account or for the account of a customer, shall report certain information to the Department of Market Regulation. The member must report information as to whether such position is hedged and, if so, a description of the hedge employed. A report must be filed when an account initially meets the aforementioned applicable threshold. Thereafter, a report must be filed for each incremental increase of 25,000 contracts. Reductions in an options position do not need to be reported. However, any

	significant change to the hedge must be reported.
Margin:	Purchases of puts or calls with 9 months or less until expiration must be paid for in full. Writers of uncovered puts or calls must deposit / maintain 100% of the option proceeds* plus 15% of the aggregate contract value (current index level x $100) minus the amount by which the option is out-of-the-money, if any, subject to a minimum for calls of option proceeds* plus 10% of the aggregate contract value and a minimum for puts of option proceeds* plus 10% of the aggregate exercise price amount. (*For calculating maintenance margin, option current market value are using instead of option proceeds.)
Cusip Number:	12486C
Trading Hours:	8:30 a.m. - 3:15 p.m. Central Time (Chicago time).

(http://www.cme.com/edu/res/sp/fx20401.html)

5.2 Application of Calculating Theoretical Futures price of TRYUSDollar

In fact , prices are determined by the market. But there is a theory to calculate future prices that must be on which level. In this application we will calculate theoretical future price of TRYUSDollar from currency futures contracts.

THEORETICAL FUTURE PRİCE OF **TRYUSDollar**

Formula is,

$$F = S * e^{(r_d - r_f)*t}$$

- F: Theoretical Future Price
- S: Spot Price
- rd: Domestic Intrest Rate
- rf: Foreign Intrest Rate
- t :Maturity date (Daigler, Robert T.s.52.).

We are calculating for end of April-2007 theoretical future contract price of **TRYUSDollar**

Today is 14-12-2006

Maturity: 137 days

Domestic Intrest Rate (try) rd:% 18,75 for 137 days (http://www.tcmb.gov.tr/).

Foreign Intrest Rate ($) rf: %5 for 137 days (http://www.tcmb.gov.tr/).

Spot exchange rate of TRYUSDollar 1 US Dollar = **1,4230TRY** (http://www.tcmb.gov.tr/).

We can then apply these input variables into the following set of equations to calculate the price for theoretical future price of TRYUSDollar.

$$\text{Theoretical future price} = 1{,}4230\, e^{(0{,}1875-0{,}05)*\frac{137}{365}}$$

$$\text{Theoretical future price} = 1{,}4230\, e^{0{,}051609589}$$

Theoretical future price =1,4230*1,052964573 = $ **1,4983**

5.2.1 Hedging with transaction

An exporter has received orders from the countries abroad. The value of it is 1 million US dollars. The firm is going to pay this amount after 3 months. The concern of the exporter is about the exchange rates. The exporter considers that the rates may decrease. So, what can this exporter make in terms of protection against the risk of decrease in exchange rates?

According to our theoretical calculation, the price of the TRY/US Dollars contract is 1.4983 today. (This contract is traded in Future Transaction Option Stock Exchange and it is due to April.).

The exporter sells the contract which is due to April and which is value is equal to 1 million US Dollars (1000 units of contracts). The amount of security that the exporter deposited due to this transaction is 15.000 TRY (150*1000=150000 TRY).(Table 5.7).

Thus, he provides the fixation of the selling price of the US Dollars to 1.4983 for the end of April.

At the end of April, if the US Dollar is traded in the spot market as 1.2600 TRY, this price is also the ending price of the future transaction since it is the end of the term. The ones,

who do not make transaction in TURKDEX, will sell the USD by 1.2600 TRY. On the other hand, the exporters who make transaction in TURKDEX, have the profit that equals to 0.2383(1.4983-1.2600=0.2383) since the future prices decreases to 1.2600 TRY.

The investor, who will sell the foreign currency that he owes in the spot market, will take 1.2600 per a dollar in the spot market and with the help of the gain in the future market which is 0.2383 TRY, he provides the fixation of the dollar selling exchange rate to 1.4983.

The total profit of this firm after these transactions in the future market is 238,300 TRY (Table 5.6).

In the due date of the contract which is 30th of April, if the spot USD foreign exchange rate isn't 1.2600 TRY/USD, the investor waits until the end of the term. At the end of the term the future prices will be equaled to the spot prices. If the rate of TRY/USD reaches to 1.4983, investor has no profit or loss, but if TRY/USD reaches to 1.5400, investor has $ 41,700 loss (Table 5.6).

Table 5.6 Profit/Loss Situation of the investor

End of maturity	Profit/Loss from future transaction	Profit/loss from spot (TRY)	Net profit/Loss
12.600	1.4983-1.2600=0.2383 (1 $) 0.2383*1000=238.3(1 contract) 238.3*1000=238,300(1000 contracts)	1,260,000-1,498,300= -238,300	0
1.4983	1.4983-1.4983=0 (1$) 0*1000= 0 (1 contract) 0*1000=0 (1000 contracts)	1,498,300-1,498,300=0	0
1.5400	1.4983-1.5400=-0.0417 -0.0417*1000= -41.7 (1 contract) -41.7*1000= - 41,700 (1000 contracts)	1,540,000-1,498,300= 41,700	0

5.2.2 Speculation with transaction

Now ,We are in February-2007 and Our expectation is that TRY/USDollar rate will be rise in two months. We buy 300 units of USDollar Futures contracts which is the term of April from the TURKDEX (Long-position). Price of USDollar futures contract which is the term of April is 1,4983 TRY (according to our theoretical future price of TRY/USdollar).

Initial Margin is 150 TRY (Table 5.7).

So, for this process We must deposit 45000 TRY(150 TRY*300=45000 TRY) for initial margin to the TURKDEX.

Hence; We have 449,490 TRY [(1.4983*1000)*300=449,490 TRY] futures contract position.

If our expectation will be going on right in March-2007, so price of contract which is the term related April rises to 1.6000.

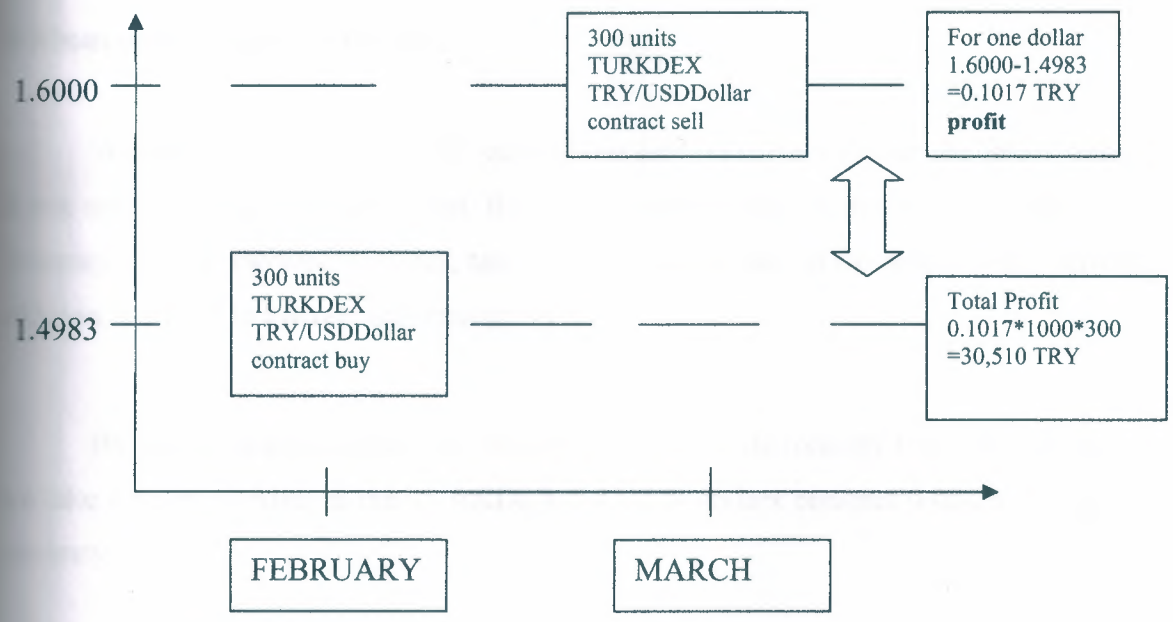
We close our position with oposite transaction with taking short-position in TRY/USDollar contract which is April term).

End of this process we can earn 30,510 TRY (1.6000-1.4983)*1000*300=**30,510** TRY (Figure 5.5).

Table 5.7 Price of TURKDEX-TRY/USDolar futures contract term of April in February and March

FEBRUARY	MARCH
Price of TURKDEX-TRY/USDollar future contract term of April 1.4983 TRY/USDollar Margin:150 TRY *300 contracts=45,000 YTR contract	Price of TURKDEX-TRY/USDollar future contract term of April 1.6000 TRY/USDollar

Figure 5.5 Total profit on TRY/USDolar future contract



5.2.3 Strategy with buying synthetic product

By using future transaction, it is feasible to obtain Treasury bill gain without using it. In other words, with the future transaction contract, synthetic investment tools can be provided and these tools can be more suitable to our note case.

Why do we need synthetic product?

The highness of tax and transaction costs, the inadequacy of the liquidity of the markets can cause synthetic products to be more attractive.

Suppose that we are an investor who has foreign currency in account. We are having concern about the drop of the foreign currency prices. Due to this, we want to sell foreign exchange

and buy treasury bill. This strategy can be realized either by using future transaction or without using it.

Without using future transaction,

We need to take Treasury bill and sell our foreign currency when the future transaction is not used. During this transaction, the exchange rates can decrease and the prices of the Treasury bill can increase. Besides, tax issue can appear due to the sold foreign currency. In addition, we need to tolerate the transaction cost.

By using future transaction, we provide a synthetic treasury bill. This happens when we take a short position in the TURKDEX TRY/US dollars contract without selling foreign currency.

For example: today (14-12-2006) the exchange rate of TRY/USD is 1.4230 (www.tcmb.gov.tr).

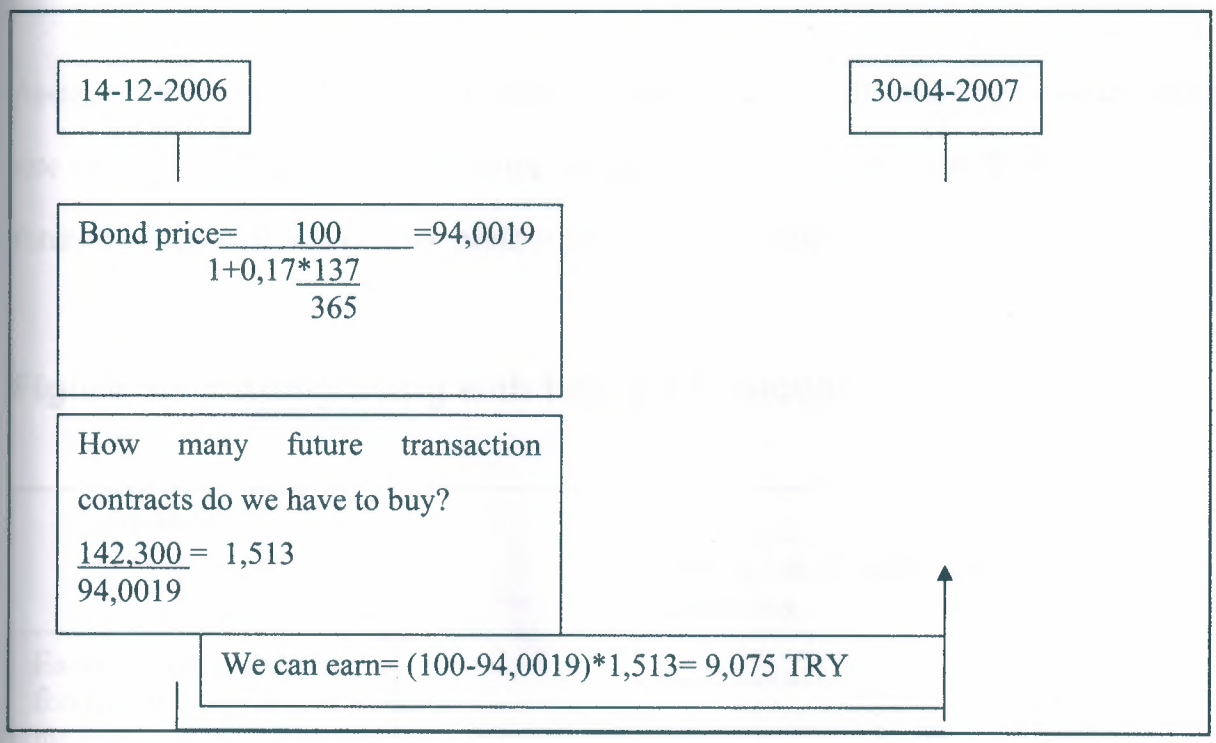
We have 100.000 dollars and we pay this amount into the bank in the Libor interest rate. We think that dollar will drop in value and we are planning to sell our dollars and thinking to make an investment on Treasury bill.

IF we sell the foreign currency and buy Treasury bill, what would our gain be after 137 days?

The value of our note case (which is 100.000 US dollars) is 1.4230* 100.000=142.300 TRY (the spot US dollar exchange rate is 1.4230 TRY/USD) (www.tcmb.gov.tr).

The interest rate of the Treasury bill is %17 (dışbank) for today and there are 137 days left for the due date. Our gain will be 9,075 TRY (Figure 5.6).

Figure 5.6 Total gains without using future transaction



Instead of buying Treasury bill and selling the foreign currency, we can sell US dollar oriented future transaction contract. What would our gain be as far as we apply this strategy?

The exchange rate is 1.4983 on the 14th of December 2006 (which is due to April 2007 in time deposit market).

How many future transaction contracts do we have to sell?

In order to answer this question, we have to know the amounts of both the interests and the US dollars that we would have at the end of the term.

$$100{,}000*\left(1+0.05*\frac{137}{365}\right)= 101{,}876 \text{ USD}$$

End of term we have 101,876 USD

Therefore we must sell $\frac{101,876}{1000}$ = 101 units contracts in 14-12-2006

Assume that the spot US dollars exchange rate decreased by %10 according to the exchange rate of the 14th of December 2006 during the date of 30-04-2007 which is the due date of the future transaction. In this case our profit is 10,149 TRY (Figure 5.7).

Figure 5.7 Earning using with future transaction

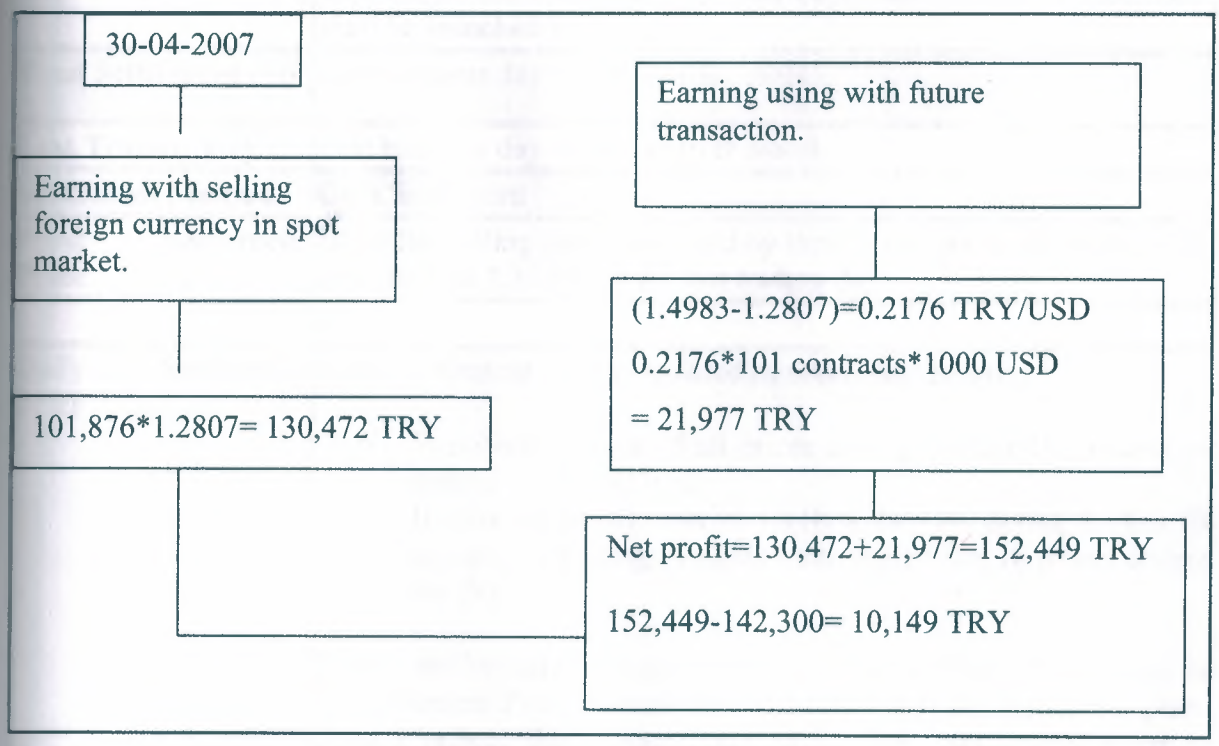


TABLE 5.8 "TurkDEX-TRYUSDollar"Futures Contract Specifications

Underlying Asset	TRY/USDollar Parity
Contract Size	1,000 USDollar
Price Quotation	New Turkish Lira per USDollar with four digits. Sample quote = 1.4155 TRY or 1.4160 TRY
Daily Price Limit	% ±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	USDollar 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, 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.
Margins **TRYDollar**	

Initial Margin (TRY)	Maintenance Margin (TRY)	Maintenance Level
150	**112.5**	**75%**

(http://www.vob.org.tr/VOBPortalTur/DesktopDefault.aspx?tabid=191)

CHAPTER 6

Conclusion and Recommendation

Derivative products were firstly used in goods market and then commonly used in financial markets. The fast development of the markets in many parts of the world in which derivative products are traded and the facts stated above in the first sentence are enough to be the proofs of the derivative products' being positive contribution to economy. Derivative products which minimize the risks caused by traditional financial tools make risk management easier and cheaper and as it is known risk management is one of the main duties of the financial system.

Besides, derivative products provide stable market balance by making the prices of future predictable. It is important for the participants of the market in which derivative tools are used, to be able to understand the complexity of the product and the possible risks that can be caused by the product that is used. In order to avoid the risks that can appear as a result of the usage of derivative product, it's important to take the necessary measures and to abstain from unnecessary risks.

Firms and people should conduct intensive observations about the determination of the risk management strategies, the kinds of derivative products to prefer and the kinds of risks to hedge while determining the risk management strategies. In order to have active derivative markets an active spot market and the need of risk transfer are necessary.

There are also some micro economic factors to be undertaken for an active derivative tool market. There has to be a meaningful relationship between the prices in the spot and future trade markets. It's impossible to determine the price of an entity, which would be traded in a future market, without taking the spot price into account.

The fluctuating exchange rate regime which was begun February 2001 in Turkey has increased the importance of the markets in which the futures contracts are traded. Freely fluctuating exchange rates are known as a pre-condition in order to avoid negative impacts when external shocks occur. However, exchange rate fluctuations can cause imbalance by increasing the debt in financial markets in terms of exchange currency. An effective risk management and observation systems conception in all the sectors would impede unnecessary loss during crisis.

As a result; the fluctuation of prices in the markets not only brings the necessity of derivative tool market but also comprises one of the pre-conditions of the continuity of the markets which are established in this way. In derivative tool market, having profits from the increase and decrease of prices or knowing the theoretical price of the related item during the decision period with the aim of reducing the risks caused by the fluctuating prices are very important. The two important ones are Black& Scholes option pricing and pricing method of futures.

Consequently, in this study two important derivatives instrument such as Future and Option are priced. When the Dow Jones Industrial Average Index Option theoretically priced, the result showed us the index will increased in the future. If we make a comparison between the result of the calculation with the Black & Scholes model of European call option and its market price which is consist after the relevant period, we can say that the market price proof the calculation result of the model. Addition to this, the second application focused on the future instrument pricing which the future contract on TRY/USD Exchange rate. This pricing application shows the future contract pricing based on exchange rate and its hedging strategies. As a result of this pricing, we showed that the exchange rate will increase after the relevant period. The relevant period is 137 day which is started at 14.12.2006 up to 30.04.2007. This analysis is based on the future exchange rate determination and results showed that the exchange will increase. After calculation we showed the possible strategies to make profit or eliminate risk of the exchange rate volatility.

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APPENDIX-1 TABLE OF DOW JONES INDUSTRIAL AVERAGE IN (DJI:^DJI) Delayed quote data

Index Value:	**12,661.74**
Trade Time:	Feb 5
Change:	**↑8.25 (0.07%)**
Prev Close:	12,653.49
Open:	12,653.41
Day's Range:	12629.86 - 12681.21
52wk Range:	10,653.20 - 12,741.30

Source:http://finance.yahoo.com/q?s=%5EDJI

APPENDIX-2 TABLE OF COMPONENTS FOR ^DJI

Symbol	Name	Last Trade	Change	Volume
AA	ALCOA INC	**32.56** Feb 5	**0.00 (0.00%)**	0
AIG	AMER INTL GROUP INC	**69.30** Feb 5	**0.00 (0.00%)**	0
AXP	AMER EXPRESS INC	**58.20** Feb 5	**0.00 (0.00%)**	0
BA	BOEING CO	**90.72** Feb 5	**0.00 (0.00%)**	0
C	CITIGROUP INC	**54.75** Feb 5	**0.00 (0.00%)**	0
CAT	CATERPILLAR INC	**64.49** Feb 5	**0.00 (0.00%)**	0
DD	DU PONT E I DE NEM	**50.10** Feb 5	**0.00 (0.00%)**	0
DIS	WALT DISNEY-DISNEY C	**35.26** Feb 5	**0.00 (0.00%)**	0
GE	GEN ELECTRIC CO	**36.37** Feb 5	**0.00 (0.00%)**	12,700
GM	GEN MOTORS	**32.71** Feb 5	**0.00 (0.00%)**	0
HD	HOME DEPOT INC	**41.03** Feb 5	**0.00 (0.00%)**	300
HON	HONEYWELL INTL INC	**46.02** Feb 5	**0.00 (0.00%)**	200
HPQ	HEWLETT PACKARD CO	**42.81** Feb 5	**0.00 (0.00%)**	900
IBM	INTL BUSINESS MACH	**100.38** Feb 5	**0.00 (0.00%)**	0
INTC	INTEL CP	**21.28** Feb 5	**0.00 (0.00%)**	54,520
JNJ	JOHNSON AND JOHNS DC	**66.30** Feb 5	**0.00 (0.00%)**	0
JPM	JP MORGAN CHASE CO	**50.96** Feb 5	**0.00 (0.00%)**	0
KO	COCA COLA CO THE	**47.90** Feb 5	**0.00 (0.00%)**	0
MCD	MCDONALDS CP	**44.53** Feb 5	**0.00 (0.00%)**	0
MMM	3M COMPANY	**73.93** Feb 5	**0.00 (0.00%)**	50,000
MO	ALTRIA GROUP INC	**86.88** Feb 5	**0.00 (0.00%)**	0

MRK	MERCK CO INC	**44.58** Feb 5	**0.00 (0.00%)**	0
MSFT	MICROSOFT CP	**29.61** Feb 5	**0.00 (0.00%)**	2,320
PFE	PFIZER INC	**26.88** Feb 5	**0.00 (0.00%)**	0
PG	PROCTER GAMBLE CO	**65.15** Feb 5	**0.00 (0.00%)**	0
T	AT&T INC.	**37.79** Feb 5	**0.00 (0.00%)**	0
UTX	UNITED TECH	**67.77** Feb 5	**0.00 (0.00%)**	0
VZ	VERIZON COMMUN	**38.09** Feb 5	**0.00 (0.00%)**	0
WMT	WAL MART STORES	**48.52** Feb 5	**0.00 (0.00%)**	0
XOM	EXXON MOBIL CP	**75.67** Feb 5	**0.00 (0.00%)**	9,600

Source:http://finance.yahoo.com/q/cp?s=%5EDJI

APPENDIX-3 TABLE OF PRICES FOR ^DJI

Date	Open	High	Low	Close	Volume	Adj Close*
5-Feb-07	12,641.08	12,681.06	12,630.50	12,661.75	2,439,429,888	12,661.75
2-Feb-07	12,673.84	12,740.65	12,582.99	12,653.49	2,569,449,984	12,653.49
1-Feb-07	12,617.20	12,741.30	12,563.85	12,673.68	2,914,889,984	12,673.68
31-Jan-07	12,520.03	12,685.54	12,461.30	12,621.69	2,976,689,920	12,621.69
30-Jan-07	12,484.70	12,538.06	12,463.07	12,523.31	2,706,249,984	12,523.31
29-Jan-07	12,487.10	12,599.74	12,422.93	12,490.78	2,730,480,128	12,490.78
26-Jan-07	12,503.28	12,582.67	12,391.44	12,487.02	2,626,619,904	12,487.02
25-Jan-07	12,621.77	12,670.48	12,461.54	12,502.56	2,994,330,112	12,502.56
24-Jan-07	12,534.37	12,659.42	12,489.98	12,621.77	2,783,180,032	12,621.77
23-Jan-07	12,467.96	12,553.44	12,467.96	12,533.81	2,975,069,952	12,533.81
22-Jan-07	12,566.33	12,619.04	12,389.68	12,477.16	2,540,120,064	12,477.16
19-Jan-07	12,567.93	12,649.89	12,462.50	12,565.53	2,777,479,936	12,565.53
18-Jan-07	12,575.06	12,674.16	12,487.90	12,567.93	2,822,429,952	12,567.93
17-Jan-07	12,563.53	12,613.28	12,550.95	12,577.15	2,690,269,952	12,577.15
16-Jan-07	12,555.84	12,638.27	12,489.90	12,582.59	2,599,529,984	12,582.59
12-Jan-07	12,514.66	12,616.08	12,432.30	12,556.08	2,686,479,872	12,556.08
11-Jan-07	12,442.96	12,586.12	12,413.72	12,514.98	2,857,870,080	12,514.98
10-Jan-07	12,417.00	12,487.18	12,313.01	12,442.16	2,764,659,968	12,442.16
9-Jan-07	12,424.77	12,516.66	12,337.85	12,416.60	3,038,380,032	12,416.60
8-Jan-07	12,393.93	12,445.37	12,337.53	12,423.49	2,763,340,032	12,423.49
5-Jan-07	12,480.05	12,504.40	12,326.79	12,398.01	2,919,399,936	12,398.01

4-Jan-07	12,467.32	12,510.26	12,405.47	12,480.69	3,004,460,032	12,480.69
3-Jan-07	12,459.54	12,630.34	12,373.82	12,474.52	3,429,159,936	12,474.52
29-Dec-06	12,500.48	12,560.16	12,423.81	12,463.15	1,678,200,064	12,463.15
28-Dec-06	12,510.57	12,566.17	12,440.23	12,501.52	1,508,569,984	12,501.52
27-Dec-06	12,463.46	12,518.34	12,407.62	12,510.57	1,667,369,984	12,510.57
26-Dec-06	12,341.94	12,439.19	12,301.40	12,407.63	1,310,310,016	12,407.63
22-Dec-06	12,407.87	12,417.96	12,341.77	12,343.21	1,647,590,016	12,343.21
21-Dec-06	12,461.62	12,526.59	12,369.97	12,421.25	2,322,409,984	12,421.25
20-Dec-06	12,471.32	12,549.35	12,393.45	12,463.87	2,387,630,080	12,463.87
19-Dec-06	12,439.51	12,517.78	12,348.50	12,471.32	2,717,060,096	12,471.32
18-Dec-06	12,446.24	12,545.74	12,372.30	12,441.27	2,568,140,032	12,441.27
15-Dec-06	12,417.96	12,536.37	12,377.35	12,445.52	3,229,580,032	12,445.52
14-Dec-06	12,317.50	12,472.76	12,271.44	12,416.76	2,729,700,096	12,416.76
13-Dec-06	12,312.71	12,411.55	12,263.19	12,317.50	2,552,260,096	12,317.50
12-Dec-06	12,328.24	12,396.01	12,222.65	12,315.58	2,738,170,112	12,315.58
11-Dec-06	12,306.21	12,399.54	12,245.32	12,328.48	2,289,900,032	12,328.48
8-Dec-06	12,256.21	12,332.16	12,243.31	12,307.48	2,440,460,032	12,307.48
7-Dec-06	12,310.13	12,396.33	12,233.06	12,278.41	2,743,150,080	12,278.41
6-Dec-06	12,328.72	12,390.88	12,239.95	12,309.25	2,725,280,000	12,309.25
5-Dec-06	12,283.69	12,398.57	12,218.24	12,331.60	2,755,699,968	12,331.60
4-Dec-06	12,195.57	12,349.87	12,149.27	12,283.85	2,766,320,128	12,283.85
1-Dec-06	12,220.97	12,289.30	12,070.52	12,194.13	2,800,979,968	12,194.13
30-Nov-06	12,226.73	12,317.10	12,118.42	12,221.93	4,006,230,016	12,221.93
29-Nov-06	12,134.40	12,283.05	12,119.70	12,226.73	2,790,970,112	12,226.73
28-Nov-06	12,095.27	12,148.78	12,073.40	12,136.44	2,639,749,888	12,136.44
27-Nov-06	12,279.13	12,303.32	12,079.01	12,121.71	2,711,209,984	12,121.71
24-Nov-06	12,321.71	12,340.89	12,219.28	12,280.17	832,550,016	12,280.17
22-Nov-06	12,321.91	12,403.54	12,238.43	12,326.95	2,237,710,080	12,326.95
21-Nov-06	12,312.13	12,409.31	12,233.94	12,321.59	2,597,939,968	12,321.59
20-Nov-06	12,340.71	12,400.10	12,257.34	12,316.54	2,546,710,016	12,316.54
17-Nov-06	12,293.49	12,342.55	12,278.20	12,342.55	2,726,099,968	12,342.55
16-Nov-06	12,250.05	12,375.37	12,204.00	12,305.82	2,835,729,920	12,305.82
15-Nov-06	12,214.37	12,326.07	12,156.37	12,251.71	2,831,130,112	12,251.71
14-Nov-06	12,132.44	12,261.15	12,051.68	12,218.01	3,027,480,064	12,218.01
13-Nov-06	12,084.89	12,164.22	12,084.89	12,131.88	2,386,340,096	12,131.88
10-Nov-06	12,102.74	12,173.08	12,074.01	12,108.43	2,290,200,064	12,108.43
9-Nov-06	12,174.70	12,236.10	12,039.59	12,103.30	3,012,049,920	12,103.30

8-Nov-06	12,147.38	12,233.54	12,051.60	12,176.54	2,814,820,096	12,176.54
7-Nov-06	12,104.75	12,239.94	12,065.20	12,156.77	2,636,389,888	12,156.77
6-Nov-06	11,985.16	12,146.45	11,973.23	12,105.55	2,533,550,080	12,105.55
3-Nov-06	12,018.30	12,095.30	11,928.97	11,986.04	2,419,729,920	11,986.04
2-Nov-06	12,023.98	12,070.25	11,938.89	12,018.54	2,646,180,096	12,018.54
1-Nov-06	12,080.25	12,160.70	11,972.99	12,031.02	2,821,159,936	12,031.02
31-Oct-06	12,086.18	12,160.46	11,986.84	12,080.73	2,803,030,016	12,080.73
30-Oct-06	12,074.01	12,117.07	12,050.23	12,086.49	2,770,439,936	12,086.49
* Close price adjusted for dividends and splits.						

Source:http://finance.yahoo.com/q/hp?s=%5EDJI&a=00&b=1&c=2005&d=11&e=1&f=2006&g=d

APPENDIX-4 TABLE OF COMPARATIVE STATISTICS FOR DOW JONES INDEX

COMPARATIVE STATISTICS

HISTORICAL PRICE-TO-EARNINGS RATIOS

Index	6/30/06	12/30/05	12/31/04	12/31/03	12/31/01	12/31/00
Dow Jones Select Dividend Index	15.35	15.02	15.22	16.18	15.52	12.61
Dow Jones U.S. Total Market Index	16.40	17.03	18.64	19.48	19.67	16.93
Dow Jones U.S. Large-Cap Value Index	13.60	13.73	15.90	15.61	15.76	15.09
Dow Jones Industrial Average	17.73	17.29	17.20	19.75	20.60	17.80

Price-to-earnings data include negative earnings figures.

HISTORICAL DIVIDEND-YIELD RATIOS

Index	6/30/06	12/30/05	12/31/04	12/31/03	12/31/01	12/31/00
Dow Jones Select Dividend Index	3.66	3.69	3.37	3.73	3.87	4.48
Dow Jones U.S. Total Market Index	1.79	1.73	1.63	1.58	1.57	1.80
Dow Jones U.S. Large-Cap Value Index	2.77	2.81	2.56	2.79	2.78	2.74
Dow Jones Industrial Average	2.39	2.39	2.09	2.04	2.01	2.27

Dividend-yield data calculated using indicated annual dividends.

RISK AND CORRELATION

Index	Volatility	Correlation vs. DJ U.S. Total Market Index	Correlation vs. DJ Select Dividend Index	Beta vs. DJ U.S. Total Market Index	Tracking Error vs. DJ U.S. Total Market Index
Dow Jones Select Dividend Index	7.72%	0.8518	1.0000	0.8102	4.33%
Dow Jones U.S. Total Market Index	8.12%	1.0000	0.8518	1.0000	0.00%
Dow Jones U.S. Large-Cap Value Index	7.14%	0.8705	0.8204	0.7651	4.00%
Dow Jones Industrial Average	8.48%	0.8987	0.8148	0.9389	3.75%

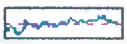
Correlation, beta, and tracking error calculated using monthly total-return index values from June 30, 2003, to June 30, 2006.

Source:http://www.dowjones.com/

APPENDIX-5 GRAPH OF DOW JONES INDUSTRIAL AVERAGE INDEX

Source:http://finance.yahoo.com

APPENDIX-6 TABLE OF Columnar

Symbol	Time	Trade	Change	% Chg	Volume	Intraday
^DJX	Feb 5	126.62	0.00	0.00%	0	
^DKU	Feb 5	1,264.11	0.00	0.00%	0	
^DXL	Feb 5	1,266.17	0.00	0.00%	0	
DJX-X.W	Jan 25	125.03	0.00	0.00%	0	N/A
DXL-X.W	Jan 25	1,250.26	0.00	0.00%	0	N/A

Source:finance.yahoo.com/q/cq?d=v1&s=%5eDJX+%5eDKU+%5eDXL+DJX-X.W+DXL-X.W

APPENDIX-7 TABLE OF 1/100 DOW JONES INDUSTRIAL AVER (Chicago Options:^DJX) Delayed quote data

Index Value:	**126.62**
Trade Time:	Feb 5
Change:	**0.00 (0.00%)**
Prev Close:	126.62
Open:	126.53
Day's Range:	126.30 - 126.81
52wk Range:	N/A

Source:finance.yahoo.com/q?s=%5EDJX

APPENDIX-8 GARPH OF 1/100 DOW JONES INDUSTRIAL AVERAGE (^DJX)

source:http://finance.yahoo.com/

Table for $N(x)$ When $x \leqslant 0$

This table shows values of $N(x)$ for $x \leqslant 0$. The table should be used with interpolation. For example,

$$N(-0.1234) = N(-0.12) - 0.34[N(-0.12) - N(-0.13)]$$
$$= 0.4522 - 0.34 \times (0.4522 - 0.4483)$$
$$= 0.4509$$

x	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
−0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−3.0	0.0014	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
−3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
−3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
−3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
−3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
−3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
−3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
−3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
−3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
−3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
−4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table for $N(x)$ When $x \geqslant 0$

This table shows values of $N(x)$ for $x \geqslant 0$. The table should be used with interpolation. For example,

$$N(0.6278) = N(0.62) + 0.78[N(0.63) - N(0.62)]$$
$$= 0.7324 + 0.78 \times (0.7357 - 0.7324)$$
$$= 0.7350$$

x	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9986	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000