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HEDŽING PRIMENOM FJUČERSA NA ROBNIM TRŽIŠTIMA - ZA I PROTIV

Prof. dr Bojan Đorđević

Fakultet za menadžment Zaječar,
Megatrend univerzitet
bojan.djordjevic@fmz.edu.rs

mr Mira Đorđević

Fakultet za menadžment Zaječar,
Megatrend univerzitet
mira.djordjevic@fmz.edu.rs

Rezime

U ovom radu istražujemo minimiziranje rizika upotrebom fjučersa. U prvom delu smo pokazali kako krakti i dugi hedž menjaju cenovni rizik baznim rizikom. Primeri hedževa su dati. Dalje, razmatrali smo unakrsni hedžing sa ročnom neusklađenošću. Takođe su razmotrene jednostavne hedžing strategije koje doprinose minimiziranju promene priliva kapitala. U zaključnom delu ovog rada bavimo se razlozima zbog kojih se kompanije opredeljuju za hedžing. Hedžing treba aktivirati nakon što su procenjeni jasni ekonomski razlozi za smanjenje rizika.

Ključne reči: hedžing, cenovni rizik, derivativi, fjučers, robna tržišta, investicije, menadžment strategija

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HEDGING USING FUTURES ON COMMODITY MARKETS - PROS AND CONS

Prof. Bojan Đorđević PhD

School of Management, Zaječar, Megatrend University
bojan.djordjevic@fmz.edu.rs

Mira Đorđević MSc

School of Management, Zaječar, Megatrend University
mira.djordjevic@fmz.edu.rs

Summary

In this paper we investigate minimization of risk by using futures. In the first section we have shown how short and long hedges replace price risk with basis risk. Examples of hedges are provided. Further, we reviewed cross hedges with maturity and asset mismatches. Simple hedging strategies that result in minimizing the variance of cash flows when hedge is lifted are also considered. The final section of this work considers reasons for the firm to hedge. Hedging activities should only be conducted after clear economic reasons for reducing risk have been articulated.

Key words: hedging, price risk, derivatives, futures, commodity markets, investments, management strategy

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Uvod

Najbolji način da se shvati hedžing (*engl.* hedging) posao ili transakcija jeste da se posmatra kao osiguranje od rizika koji proizilaze iz tekućeg poslovanja. Kada se menadžeri odluče za hedžing, oni sebe i biznis kompanije osiguravaju od efekata mogućih negativnih događaja. Ovo ne sprečava da se negativan događaj desi, ali ukoliko se on desi i kompanija je pravilno osigurana, uticaj negativnog događaja će biti smanjen. Portfolio menadžeri, samostalni investitori i korporacije koriste hedžing tehnike da bi smanjile izlaganje različitim vrstama rizika. Međutim, na finansijskom tržištu hedžing postaje mnogo komplikovaniji od prostog plaćanja premije osiguravajućoj kompaniji svake godine. Hedžing protiv investicionog rizika znači strategijsko korišćenje instrumenata na tržištu da bi umanjili rizik od bilo kojih nepovoljnih promena cena. Drugim rečima, investitori hedžuju jednu investiciju tako što ulažu u drugu investiciju. Tehnički rečeno, da bi smo hedžovali, moramo investirati u dve hartije od vrednosti sa negativnom koleracijom.

U finansijama hedžing jeste investicija koja služi da smanji ili ukine rizik koji se odnosi na neku drugu investiciju. Hedžing je strategijski kreiran da minimizira izlaganje investicije nepoželjnom poslovnom riziku, ali i takođe da dozvoli tom poslovnom poduhvatu da profitira od te investicije. Stoga onaj koji hedžuje neće biti zainteresovan za to da li vrednost tržišta kao celine ide gore ili dole, već samo za delove tržišta koji su relevantni za hedžing.

U većini slučajeva, hedžing tehnike uključuju korišćenje izvedenih finansijskih instrumenata poznatijih kao *finansijski derivativi*. Dva najčešće korišćena derivativa su fjučersi i opcije. *Fjučersi* su ugovori između dve strane koji se odnose na kupovinu ili prodaju neke aktive u određeno vreme po određenoj ceni. Glavni razlog zašto kompanije koriste fjučerse jeste da bi ograničili njihovo izlaganje riziku usled bilo kakvih fluktuacija cena na tržištu. *Opcije* su ugovori koji daju pravo kupcu, ali ga i ne obavezuju, da kupi ili proda naznačenu aktivu po određenoj ceni na određeni datum, ili pre tog datuma. Na primeru se može pokazati kako se ovi derivativi koriste (CBOT, 2003). Recimo da posedujemo akcije kompanije proizvođača tekile (KPT). Iako imamo poverenja u ovu kompaniju na dugi rok, malo smo zabrinuti zbog nekih trenutnih padova u industriji tekila pića. Da bi smo se zaštitili od pada vrednosti akcija KPT-a možemo kupiti prodajnu opciju (put option) za tu kompaniju, što nam daje za pravo da prodamo akcije KPT-a po ugovorenoj ceni. Ukoliko cene naših akcija budu padale ispod ugovorene cene, ovi gubici će biti smanjeni za razliku između cene akcije i prodajne opcije. Drugi klasični primer hedžinga uključuje kompanije koje zavise od izvesnih roba. Pretpostavimo da je KPT zabrinut zbog nestabilnosti cena agave, biljke od koje se pravi tekila. Kompanija bi bila u velikim problemima ukoliko cena agave znatno skoči, što bi ozbiljno ugrozilo marginalni profit. Da bi se zaštitila (hedžovala) od nepredvidivosti kretanja cena agave, KPT može kupiti fjučerse koji omogućavaju kompaniji da kupi agavu po određenoj ceni. Sada KPT može budžetirati bez brige oko fluktuiranja cena date robe. Ukoliko cena agave pređe preko ugovorene cene fjučersa, hedžing će se isplatiti zato što će KPT uštedeti novac plaćajući nižu cenu. Međutim, ukoliko cene padnu, a KPT je u obavezi da plati ugovorenu cenu i tada bi u stvari bilo bolje da nismo hedžovali. Imajmo na umu da zbog toga što postoje mnoge različite vrste opcija i fjučersa, investitor ima mogućnost da hedžuje mnogo toga kao što su: akcije, cene raznih roba, kamatne stope ili valute. Generalno gledano, sve strategije hedžinga se zasnivaju na pronalaženju razlike između tržišne vrednosti i teoretske odnosno „stvarne" vrednosti, i pokušaju da ostvare profit i kada vrednosti padaju odnosno rastu, zavisno šta se kupuje ili prodaje.

Mnogi od učesnika na terminskim tržištima su hedžeri (pored neizostavnih *špekulanata* koji pretežno koriste fjučerse u cilju ostvarivanja profita). Njihov cilj je da koriste tržišta fjučersa da bi smanjili rizik sa kojim se susreću. Rizik se može odnositi na fluktuaciju cene nafte, deviznog kursa, berzanskog indeksa, ili neku drugu varijablu. *Savršeni hedž* je onaj koji potpuno eliminiše rizik. Savršeni hedževi su retkost. Prema tome, studija hedžinga koji koriste fjučerse je studija načina na koji se hedževi mogu konstruisati tako da njihove performanse budu što bliže savršenim (Hull, 2009, str. 45; Geman, 2005, str. 5).

Introduction

The best way to understand hedging deals or transactions is to consider it as insurance from the risks arising in the current business. When managers decide to hedge they are insuring themselves and the company business from the effects of possible negative events. This would not prevent the negative event to occur, but if it should materialise and the company is properly insured, the effects of such a negative event would be minimised. Portfolio managers, independent investors and corporations are using hedging techniques in order to reduce exposure to different types of risks. However, on financial markets, hedging becomes much more complex than a simple premium paid to an insurance company every year. Hedging versus investment risk means a strategic use of an instrument on the market aimed at lowering the risk of any adverse price changes. In other words, investors are hedging an investment by investing in another investment. Technically speaking, in order to hedge we must invest in two securities with negative correlation.

In finances, hedging is an investment serving to lower or eliminate risk implied in anther investment. Hedging is strategically created to minimize exposure of investments to an undesirable business risk, but also to allow such a business venture to profit from that investment. Hence those who are hedging will not be interested in whether the market value as a whole is going up or down, but only in those parts of the market which are relevant for the hedging.

In most cases, hedging techniques include the use of derived financial instruments known as *financial derivatives.* The two most often used derivatives are the futures and the options. *Futures* are the contracts between the two counterparties agreed upon for buying or selling of a certain asset, at a set time and at a set price. The main reason why companies are using futures is to limit their risk exposure due to any price fluctuation on the market. *Options* are contracts giving the right to the buyer, but not binding him, to buy or sell the designated asset at a set price and at a set date, or prior to that date. We shall give an example that shows how these derivatives are used (CBOT, 2003). Let us assume that we own the shares of a tequila producing company (TPC). Although we have full confidence in this company on long-term basis, we are a bit concerned about some actual downturns occurring in the industry of tequila drinks. In order to protect ourselves from the fall in the price of shares of the TPC, we can buy a selling option (put option) for that company, which gives us the right to sell TPC shares at a contracted price. If the price of our shares is to fall below the contracted price, these losses will be reduced for the difference between the price of a share and the put option. The second classic example of hedging is the case of those companies that are dependant on certain commodities. Let us assume that the TPC is concerned about the instability in prices of agave plant, the plant that tequila is produced from. The company would face major problems if the price of agave would suddenly go up, which would seriously endanger the profit margin. In order to protect itself (to hedge) from the uncertainty of the agave price movement, TPC can buy the futures allowing the company to buy the agave plant at a set price. The TPC Company can now budget its finances without any concern about the fluctuating price of the given commodity. If the price of agave should exceed the contracted futures price, hedging will pay off because the TPC will save money by paying the lower price. However, if the price is to fall, TPC will be bound to pay the contracted price and in such a situation in would have been actually better if we have not hedged. Let us bear in mind that because of the fact that there are many different types of options and futures, an investor is in the position to hedge many things such as: shares, prices of various goods, interest rates, or currencies. Generally speaking, all of the hedging strategies are based on finding the difference between the market value and the theoretical or "fair" value, and in the attempt to make profit even when the values are falling i.e. rising, depending on what we are buying or selling.

Many of the participants in the forward markets are the hedgers (in addition to the unavoidable *speculators* who are mostly using futures for making profit). Their aim is to use the futures market for minimizing the risk that they face. Risk can relate to the oil price fluctuation,

U ovom radu razmatramo neke opšte stavke koje se odnose na način na koji su hedževi postavljeni. Pokušaćemo da damo odgovore na nekoliko pitanja, i to: kada je odgovarajuća pozicija kratkog fjučersa? Kada je odgovarajuća pozicija dugog fjučersa? Kada treba da se koriste fjučers ugovori? Koja je optimalna veličina pozicije fjučersa za smanjenje rizika? U ovom stadijumu, ograničićemo našu pažnju na tzv. *hedž-i-zaboravi* strategije (*engl*. hedge and forget strategies). Pretpostavljamo da kad se hedž jednom postavi, ne vrše se nikakve korekcije. Hedžer jednostavno preuzima poziciju fjučersa na početku ciklusa hedža i zatvara poziciju na kraju njegovog ciklusa. Ovaj rad se u prvom delu bavi osnovnim karakteristikama terminske trgovine i fjučersima kao forvardnim ugovorima (na bazi dnevnog poravnanja). Kasnije se objašnjava prilagođavanje poznato kao „praćenje", gde se vodi računa o razlici između fjučersa i forvarda. Na kraju se daju argumenti zašto treba primenjivati hedžing i pod kojim uslovima.

Osnovne karakteristike terminskih tržišta

Nastanak i razvoj terminskih tržišta vezan je za pokušaje proizvođača i ostalih korisnika roba da izbegnu nestabilnost robnih cena. Po prvi put se primeri primene takvih tehnika javljaju na Berzi pamuka u Liverpulu, Engleska, u 18. veku gde su prodavci i kupci su sklapali sporazum o ceni, količini i mogućem datumu isporuke robe dok je ona još uvek bila u transportu na moru. Uz pretpostavku da je brod sa robom stigao u luku do datuma isporuke i da je tovar robe odgovarao specifikacijama kvaliteta i kvantiteta, sporazum koji je dogovoren bi bio izvršen plaćanjem i isporukom (Foley, 1993, str. 147). Moderno terminsko poslovanje na robnim berzama počinje u 19. veku na području američkog srednjeg zapada i to na Čikaškoj robnoj berzi (Chicago Board of Trade - CBOT) koja je osnovana 1848. godine. Prvi terminski ugovori javljaju se 1865. godine. Standardizacija ugovora, a time i mogućnost zamene jednog ugovora za drugi (tzv. offset), prouzrokovala je ubrzani rast prometa terminskim ugovorima. Prava ekspanzija trgovanja terminskim ugovorima započinje sedamdesetih godina prošlog veka, kada je ukinut sistem fiksnih deviznih kurseva, tačnije 1973. god. kada se javlja prva vrsta opcija - *opcije na akcije* na Čikaškoj berzi opcija (Chicago Board Options Exchange - CBOE). Desetak godina kasnije, 1982.god., dolazi do novog, bitnog iskoraka na terminskim berzama, razmahuje se trgovinama opcijama na terminske ugovore, i tada se javljaju opcije na fjučerse ili robne opcije (*commodity options* ili *futures options*) na Njujorškoj robnoj berzi (NYBOT). Pored prethodno pomenutih prvih i osnovnih opcijskih derivata (opcija na akcije i fjučerse), danas u trgovini na terminskim tržištima imamo i opcije na kamatne stope, opcije na indekse akcija i opcije na valute (Eremić, 2004, str. 7). Treba napomenuti da se pored trgovanja na organizovanom tržištu - berzi, opcijama trguje i na vanberzanskom tržištu (*Over-The-Counter* - OTC) tržištu. Tako se opcijama na akcije trguje najviše na CBOE, AMEX, NYSE, LIFFE berzama, opcijama na berzanske indekse na NYSE (indeks S&P 100), dok je za kamatne i valutne opcije karakteristična OTC trgovina.

Terminski poslovi se baziraju na ugovorima sklopljenim na parketu berze za kupovinu ili prodaju neke aktive u budućnosti. Terminskim ugovorima se najviše trguje na vanberzanskim tržištima (Over The Counter - OTC) između finansijskih institucija ili finansijskih institucija i njihovih klijenata. Jedna od strana u poslu (ugovoru) zauzima dugu (long) poziciju i pristaje na kupovinu predmeta trgovanja po unapred dogovorenoj ceni na određeni datum u budućnosti. Druga strana zauzima kratku (short) poziciju i pristaje na prodaju određenog predmeta po dogovorenoj ceni na isti datum. Terminska cena u ugovoru se može predstaviti kao prikaz vrednosti isporuke određene aktive (roba, valute, kamatne stope, indeksi) na određenoj lokaciji u određeno vreme. U odnosu na standardizovane elemente ugovora (kvalitet, mesto, vreme), terminska cena se dogovara između zainteresovanih strana na parketu berze. Zato će u zavisnosti od vremena isporuke npr. roba imati različitu cenu. Što je duži ili dalji period isporuke, roba će imati veću terminsku cenu i obrnuto. Razlog su troškovi skladištenja robe. Treba istaći da osnovna funkcija terminskih tržišta nije kupoprodaja fizičke robe, već je osnovni zadatak formulisanje terminskih cena koje predstavljaju buduće promptne cene

to the exchange rate, to stock exchange indexes, or to some other variable. *The perfect hedge* is the one that totally eliminates the risk. Perfect hedges, however, are rather few. Therefore, the study of hedging using futures is a study of the ways that hedging can be constructed so that their performance is close to perfect (Hull, 2009, p. 45; Geman, 2006, p. 5).

In this paper we shall examine some of the general prerequisites pertaining to the way in which hedges are positioned. We shall try to give the answers to several questions: When is the short hedging position appropriate? When is the long hedging position appropriate? When are the futures contracts to be used? What is the optimum futures position size to reduce risk? In this stage we shall limit our attention to the so-called *hedge-and-forget* strategies. Let us assume that once hedge is set in place no other correction is made. Hedger is simply taking position in the futures at the beginning of the hedging cycle and is closing the position at the end of the cycle. This paper, in its first section, is dealing with the basic characteristics of the forwards trading and futures as the forwards contracts (on the basis of daily settlement). Later on we shall explain the adjustment known as the "follow-up", where care is taken of the difference between futures and forwards. At the end, arguments will be given why hedging should be used and on what conditions.

Basic characteristics of the forward markets

The creation and development of the forward market is associated with the attempts by the producers and other users of commodities to avoid instability of commodity prices. The earliest cases when such techniques have appeared was on the Cotton Commodity Market in Liverpool, England, in the 18th century, when the sellers and buyers were contracting agreements on the price, quantity and the possible dates for delivery of goods, while it was still being transported oversees. On the assumption that the vessel carrying the goods had arrived at the port of call on the delivery date and that the shipment of goods was corresponding to the specification regarding its quality and quantity, the agreement previously contracted would be executed through the payment for and delivery of goods (Foley, 1993, p. 147). The modern forward dealing on commodity markets was to start in the 19th century in the area of the American Midwest, ie. on the Chicago Board of Trade - CBOT, established in 1848. The first forward contracts were to appear in 1865. Forward contract standardisation, hence the possibility to replace one contract with another one (the so-called offset), caused an accelerated growth in trade with forward contracts. The true expansion of trading in forward contracts started in the 1970s when the system of the fixed exchange rates was abolished, or more precisely in 1973, when the first option was to appear - *the stock option* on the Chicago Board Options Exchange - CBOE. Some ten years later, in 1982, a new and significant step was to be taken on the forward exchanges, with the flourishing of trading options on forward contracts, and when the *options on futures* or *commodity options or futures options* appeared on the New York Board of Trade - NYBOT. In addition to the previously mentioned earliest and basic option derivatives (stock options and futures) in trading today on the forward markets we also have the interest rate options, stock index options, and currency options (Eremic, 2004, p. 7). It should be noted that in addition to trading on the organised market - stock exchange, options are also traded on the *Over-the-Counter OTC* market. Thus the stock options are mostly traded on the CBOE, AMEX, NYSE, LIFFE stock exchanges, stock exchange index options on the NYSE (index S&P 100), while the interest rate and currency options are characteristic for the OTC trading.

Forward deals are based on contracts concluded on the stock exchange floor for the future buying or selling of a certain asset. Forward contracts are mostly traded on the Over the Counter - OTC markets between financial institutions, or financial institutions and their clients. One party in this deal (contracting party) takes a long position and accepts to buy the subject of trade at an in advance agreed upon price, on a certain date in future. The other side (counterparty) takes a short position and accepts to sell a certain item at an agreed price on the same date. Forward price in the contract would be presented as the display of the value of

na dan dospeća ili isporuke (u žargonu se terminska tržišta nazivaju „prognozeri tržišta“). Suština kretanja terminskih cena nalazi se u shvatanjima kupaca i prodavaca tj. u ponudi i potražnji za robama i uslugama. Cene su određene onim koliko je neko voljan da plati za ponuđeni proizvod ili uslugu. Danas se na terminskim berzama kupuje i prodaje gotovo sve, od poljoprivrednih proizvoda, pamuka, svile, zlata i nafte, pa sve do najsloženijih oblika finansijskih instrumenata kao što su indeksi na akcije, kamatne stope i opcije na sve navedene vrste terminskih ugovora. Terminsko trgovanje često se naziva “trgovanje vetrom“, „konfuzija u konfuziji" ili "trgovina maglom", jer njegova osnovna svrha nije fizička isporuka robe ili sticanje vlasništva nad tom robom, već formiranje terminskih i budućih promptnih ili spot cena.

Učesnici na današnjim turbulentnim tržištima suočavaju se sa globalizacijom i njenim posledicama, kao što su rastuća konkurencija, zahtevniji kupci i potreba uvažavanja zahteva šire društvene zajednice. Sve ove stavke utiču na formiranje cena roba na svetskom tržištu. Cene se menjaju svakodnevno, pa dugotrajno držanje zaliha može imati negativne posedice na finansijski rezultat kompanija, osim rizika promene cena tokom vremena razni su elementi koji utiču na cene roba. To mogu biti: elementarne nepogode, politički i socijalni nemiri i sl. Jedan od načina smanjenja rizika cena jeste upotreba terminskih tržišta, gde se, kupoprodajom terminskih ugovora, rizik prenosi sa proizvođača i kupca robe na profesionalne trgovce, špekulante. Na taj način se formiraju buduće promptne ili spot cene i na bazi tih podataka proizvođači, prerađivači i trgovci imaju informaciju o cenama u budućnosti. Koristeći se tim informacijama, pojedinci i kompanije su u mogućnosti da smanje rizik koji proističe iz nužnosti donošenja odluka u uslovima neizvesnosti. Standardizovani terminski ugovor je mehanizam pomoću koga se poslovni rizik prenosi sa proizvođača i korisnika roba na špekulante koji su voljni da preuzmu rizik u zamenu za mogućnost ostvarenja velikih dobitaka. Budući da su proizvođači i korisnici u mogućnosti da prenesu svoje rizike, oni mogu uspešnije da planiraju i time smanje troškove svog poslovanja. Krajnji korisnik terminskih tržišta je potrošač, koji plaća nižu cenu za određene robe (Andrijanić, 2002, str. 236). U standardne terminske ugovore spadaju: 1. prosti terminski ugovor ili forvard i 2. likvidni terminski ugovor ili fjučers. Forvard ugovor kreiran je sa ciljem stvarne isporuke robe u datumu dospeća i nije prenosiv. Fjučers je ugovor koji je likvidan tj. prenosivog karaktera do isteka dospeća i špekulativnog je karaktera. Statistički je pokazano da se od ogromnog, milionskog broja fjučers ugovora izvrši samo 2% (isporuči roba iz baze fjučersa) (Djordjević, 2009).

Osnovni principi hedžinga

Primarna ekonomska funkcija terminskih tržišta je upravljanje cenovnim rizikom, a najučestalija strategija trgovanja je hedžing. Hedžing je skup tehnika i instrumenata kojima je svrha pokriće od rizika skoka ili pada cena predmeta trgovanja. Trgovci koji se koriste hedžingom, tj. hedžeri koriste terminsko tržište isključivo radi zaštite od rizika porasta ili smanjenja cena kako bi sprečili gubitak, a ne za špekulisanje odnosno ostvarivanje profita. Zato je za razumevanje hedžinga i uspešnoga hedžiranja nužno poznavanje terminskog tržišta, njegovih zakonitosti i strategija trgovanja. Hedžing program bilo koje kompanije uvek je jedinstven i zavisiće od internih specifičnosti same kompanije, njene cenovne politike i motivima za hedžing. Hedžing programi se takođe moraju sve vreme prilagođavati novonastalim uslovima na tržištu (Sampson, Crowson, 2005, str. 93). Trgovac koji trguje na terminskom tržištu hedžing koristi na način da zauzima poziciju na terminskom tržištu koja je po veličini ista, a po smeru suprotna od pozicije koju drži na spot tržištu. Na taj je način gubitak na jednom tržištu biće kompenzovan dobitkom na drugom. Prema nekim tvrdnjama investitor se osiguravajući od rizika hedžiranjem osigurao i od dobitka. To je istina, ali trgovci koji koriste hedžing najčešće nisu špekulanti koji žele zaradu preuzimajući rizik, već stvarni proizvođači koji poseduju ili žele da poseduju robu i koji će na njenoj kupoprodaji ostvariti zaradu, a hedžing im koristi samo kao sredstvo osiguranja cene za tu kupoprodaju.

Kada kompanija odabere terminsko odnosno tržište fjučersa da bi se zaštitila od rizika, cilj je obično da se zauzme pozicija koja neutrališe

delivery of a certain asset (commodity, currency, interest rate, index), on the given location and at the given time. In respect to the standardized contract elements (quality, place, time), forward price is agreed upon between the counterparties on the stock exchange floor. Hence depending on the delivery term, for example, the goods contracted will have different prices. The longer or further delivery term, the goods will have higher forward price, and vice versa. The reasons for this are the costs of storage of goods. It should be mentioned that the basic function of the forward markets is not buying and selling of physical goods, but the main task is formulation of the forward prices which represent the future prompt - spot prices on the due date or delivery date (in jargon forward markets are called "market prognostics"). The essence of forward price movement is in the perception of buyers and sellers i.e. in the supply and demand for goods and services. Prices are determined by what someone is ready to pay for a certain product or service on offer. Today, at the forward markets almost everything is being traded, from agricultural products, cotton, silk, gold and oil, and up to the most complex forms of financial instruments, such as stocks, interest rates and options on all the above mentioned types of forward contracts. Forward trading is often called "trading in wind", "confusion in confusion", or "trading in a fog", as its main purpose is not physical delivery of goods or acquiring ownership over such goods, but formation of forwards and future prompt or spot prices.

Participants on the present-day turbulent markets are faced with globalisation and its consequences, growing competitons, buyers with high demands and the necessity to respect requirements of a broader social community. All of these features are impacting pricing of commodities on the world market. Prices are changed on daily basis, so any longer holding of inventories may have a negative effect on financial result of companies, and except for the risk of price change over time there are also various elements that are impacting commodity prices. These can be: natural disasters, political and social unrests, and similar. One of the ways to reduce price risk is to use forward markets, where selling and buying of forward contracts is transferring risk from the producer and buyer of goods on to the professional traders, speculators. In this way, future prompt or spot prices are being formed, and on the basis of such data producers, processors and traders are gaining information about the prices in future. Using such information, individuals and companies alike are in the position to reduce risk which arises from the necessity to make decisions in the climate of uncertainty. A standardised forward contract is a mechanism allowing for the business risk to be transferred from the producer and user of goods on to the speculators who are willing to take upon themselves the risk in exchange for the possibility of making large profits. Since the producers and users are able to transfer their risks, they can engage in a more successful planning and hence reduce costs of their business. The end user or ultimate beneficiary of forwrd markets is the consumer who is paying a lower price for the given commodity (Andrijanic, 2002, p. 236). The standard forward contracts are the following: 1. Simple forward contract or forward; and 2. Liquid forward contract or futures. Forward contract was created with the aim of seeing real delivery of goods at the due date and is not transferable. Futures contract is the one which is liquid i.e. of a transferable, negotiable character until the due date of its maturity and is of a speculative character. Statistics show that from an enormous amount, in millions of futures contracts, only 2% are being effected (goods delivered as stipulated in the basic futures contract) (Djordjevic, 2009).

The basic hedging principles

The primary economic function of the futures markets is the price risk management, and the most frequent trading strategy is hedging. Hedging is a set of techniques and instruments aimed at covering risk of price rise or fall of the commodity traded. Traders using hedging, i.e. hedgers, use the forward market exclusively for protection from the price rise or fall risk in order to prevent loss, and not for speculating or making profit. Hence understanding hedging, and a successful hedging at that, requires good knowledge of the forward market, its rules of conduct and strategies applied in trading.

rizik koliko je to god moguće. Uzmimo na primer kompaniju koja zna da će dobiti 10.000 US$ za svaki 1 cent (¢) porasta cene robe u narednih 3 meseca, i da će izgubiti isto toliko po svakom 1 centu pada cene robe u istom tom periodu. Da bi se zaštitila od rizika, kompanija bi trebalo da zauzme kratku poziciju, koja je stvorena da otkloni ili umanji rizik. Pozicija terminskog ugovora treba da dovede do gubitka $10.000 za svaki 1 cent rasta cene robe u periodu od 3 meseca, i do dobitka od $10.000 za svaki 1 cent za koji će cena pasti u tom periodu. Ako cena robe ide na dole, dobitak na poziciji poravnava gubitak na ostatku kompanijskog biznisa. Ukoliko pak cena robe raste, gubitak se ravna sa dobitkom na ostalim kompanijskim poslovima.

Kratki hedž (Short hedge)

Kratki hedž (*engl.* short hedge) je vrsta hedžinga, kao prethodno opisan, koji podrazumeva kratku (prodajnu) poziciju u terminskom ugovoru (*engl.* short position). Kratki hedž je koristan kad hedžer već poseduje sredstva (imovinu, robu) i očekuje da je proda u neko dogledno vreme. Na primer, kratki hedž može da koristi farmer koji poseduje živu stoku i zna da će ona za dva meseca biti spremna za prodaju na lokalnom tržištu. Kratki hedž se takođe može koristiti kad se imovina ne poseduje u datom trenutku, ali će biti u posedu u neko vreme u budućnosti. Uzmimo, na primer, kompaniju - izvoznika koja zna da će za 3 meseca dobiti određenu sumu novca u evrima (EUR). Izvoznik će biti na dobitku ukoliko vrednost evra poraste u odnosu na američki dolar (US$), a imaće gubitke ako kurs evra padne u odnosu na američki dolar. Kratka pozicija vodi do gubitka ako evro skoči, odnosno do dobitka ako padne u odnosu na američki dolar. Ona ima efekat poravnanja rizika za izvoznika (Djordjević, 2012).

Da bi detaljnije objasnili funkciju kratkog hedža u određenoj situaciji, iskoristićemo primere koje su dali Hull (2009) i Schofield (2007). Pretpostavimo da je danas 15. maj i da je proizvođač nafte upravo sklopio ugovor o prodaji 1 milion barela (bbl) sirove nafte tipa Brent (Brent Crude Oil). Dogovoreno je da će cena koja će se primeniti u ugovoru biti tržišna cena važeća dana 15. avgusta. Proizvođač nafte je dakle u poziciji gde će dobiti US$10.000 za svaki 1 cent za koji skoči cena nafte u naredna 3 meseca i izgubiti US$10.000 za svaki 1 cent za koji padne cena nafte u tom periodu. Pretpostavimo da je 15. maja tržišna cena bila 109.41US$/bbl , a da je cena fjučersa sirove nafte na njujorškoj trgovinskoj berzi (NYMEX) za avgustovsku isporuku 107.10 US/bbl. Kako svaki fjučers na NYMEX-u podrazumeva isporuku 1.000 bbl nafte, kompanija može da se zaštiti od rizika tako što će skratiti 1.000 fjučersa. Ukoliko proizvođač nafte zatvori svoju poziciju 15. avgusta, efekat ove strategije biće zaključenje cene od približno 107.10 US$/bbl.

Pretpostavimo dalje da se ispostavi da je tržišna cena 15. avgusta 103.10 US$/bbl. Kompanija ostvaruje 103.10 miliona US$ za naftu po prodajnom ugovoru. Kako je avgust mesec isporuke za taj terminski ugovor, cena fjučersa 15. avgusta treba da bude veoma blizu tržišne cene od 103.10 US$/bbl na taj dan (konvergencija spot i fjučers cene). Prema tome, kompanija otprilike dobija

107.10 US$ - 103.10 US$ = 4 US$/bbl

odnosno dobija ukupno 4 miliona US$ od kratke pozicije. Ukupna suma ostvarena kako od pozicije fjučersa, tako i od prodajnog ugovora, je okvirno 107.10 US$/bbl, tj. ukupno 107.10 miliona US$.

Za drugačiji ishod, uzmimo da se pokazalo da je cena nafte 15. avgusta 114.10 US$/bbl. Kompanija ostvaruje prihod od 114.10 US$ za naftu i gubi približno

114.10 US$ - 107.10 US$ = 7 US$/bbl

od kratke pozicije. Ponovo, ukupna suma koja je ostvarena je približno 107.10 miliona US$. Jasno se vidi da je u oba slučaja kompanija završila sa približno sa 107 miliona US$.

Hedging programme of any company is always a unique one and will depend on the internal specificities of the company itself, its pricing policy and motivation for hedging. Hedging programmes also have to be continuously adjusted to the newly arrived market conditions (Sampson, Crowson, 2005, p. 93). Trader who is trading in the forward market is using hedging by way of taking up position on the forwards market that is the same in size, but in the direction opposite from the position which he is holding on the spot market. In this way he will have the loss on one market compensated by the gain on another market. According to some views, the investor by securing himself from the risk by hedging has insured himself from the gain as well. This is true, but traders using hedging most often are not speculators wishing to gain by taking upon themselves the risk, but real producers who are holding or wishing to hold the goods, and who will in its trade make profit, while hedging is useful for them only as the means to secure the price for such a trade.

When the company engages in forwards or futures market in order to protect itself from risk, the aim is usually to take such a position that will neutralise the risk as much as possible. Let us examine the case of the company that knows that it will gain 10,000 US$ for every 1 cent of price growth over the next 3 months, and that it will lose the same amount for every 1 cent of price fall over the same period. In order to protect itself from risk, the company should take a short position, which is created in order to eliminate or mitigate the risk. The forward contract position should bring about the loss of $10,000 for every 1 cent of growth in price of goods over a period of three months, and should bring gain of $10,000 for every 1 cent of price fall over that period. If the price of goods should fall, the gain on this position will even-out the loss in the rest of the company business. If the price of goods is to rise, the loss will be evened-out with the gain from the other company business.

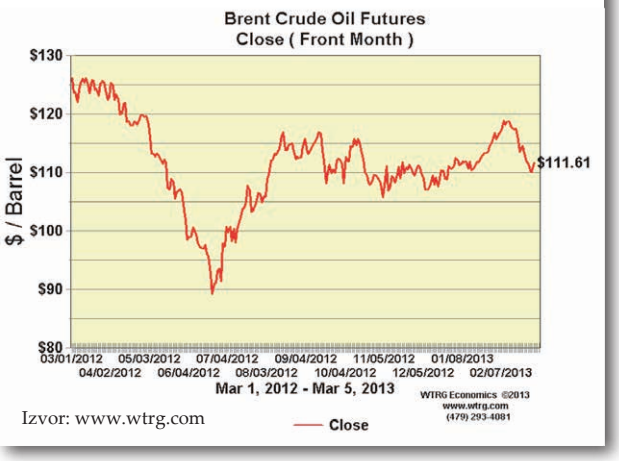
Short hedge

Short hedge is the type of hedging, as previously described, which designates a short (sales) position in the forward contract. The short hedge is useful when a hedger already holds resources (assets, goods) and is expecting to sell them at some given time in near future. For example, short hedge can be used by a farmer who is having livestock and knows that, in two-month's time, it will be ready for sale on the local market. Short hedge can also be used when the assets are not in possession at the given time, but will be held in possession at some time in future. Let us examine the case of a company - exporter that knows that in 3-month time it will receive a certain amount of money in EUR. The exporter will make profit if the value of EUR is to grow in respect to the US$, and will suffer loss if the exchange rate of EUR will fall in respect to the US$. The short position will lead to the loss if EUR is to rise, i.e. it will lead to profit is it will fall in respect to the US$. It has the effect of levelling off of the risk for the exporter (Djordjevic, 2012).

In order to explain in more detail the function of the short hedge in a certain situation, let us use the cases given by Hull (2009) and Schofield (2007). Let us assume that today, 15th of May, the oil producer has just contracted sales agreement for 1 million barrels (bbl) of Brent Crude Oil. It was agreed that the price to be applied under contract will be the market price valid on 15th of August. Thus the oil producer is in the position to make gain of US$10,000 for every 1 cent of oil price rise over the next 3 months, and to lose US$10,000 for every 1 cent of oil price fall in that same period. Let us assume that the market price on 15th of May was 109.41US$/bbl, and that the e Brent Crude Oil futures price on the New York Market Exchange (NYMEX) for the August delivery is 107.10 US$/bbl. As every futures contract on the NYMEX is for the delivery of 1,000 bbl of oil, the company can protect itself from risk by shortening 1,000 futures. In case the oil producer is to close his position on 15th of August, the effect of this strategy will be the price concluded at approximately 107.10 US$/bbl.

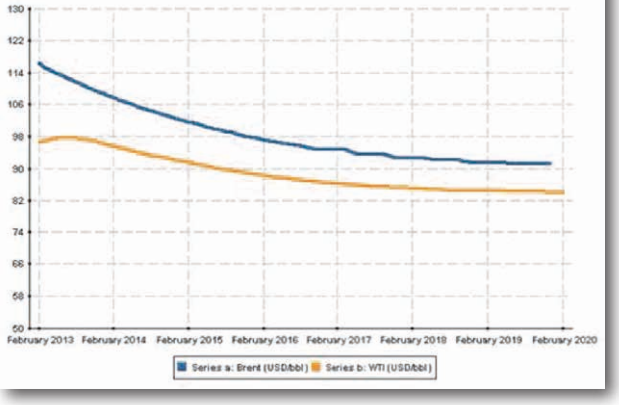
Let us further assume that it turned out that the market price on 15th of August was 103.10 US$/bbl. The company makes 103.10 million US$ for oil under the sales contract. As the month of August is the month of delivery under this futures contract, the price of futures as of 15th of August should be very close to the market price of 103.10 US$/bbl on that day (convergence between spot and futures price).

Slika 1. Kretanje cena fjučersa na naftu tipa Brent na NYMEX-u u periodu mart 2012 - mart 2013.



Izvor: www.wtrg.com

Slika 2. Projekcija kretanja cena fjučers ugovora na naftu tipa Brent i WTI za period do 2020. godine



Kratki hedž obuhvata one koji uzgajaju, skladište, proizvode ili distribuiraju stvarnu robu. Na primer, uvoznik nafte ima tanker sirove nafte na putu za rafineriju i on će koristiti kratki hedž za zaštitu svog tereta od rizika pada cena. Skladištari žitarica će takođe koristiti kratki hedž da zaštite cenu svojih žitarica koje čuvaju u svojim skladištima. Svima je zajedničko postojanje rizika gubitka usled smanjenja cena na promptnom tržištu (Andrijanić, 2002, str. 99).

Dugi hedž (Long hedge)

Hedževi koji podrazumevaju zauzimanje duge (kupovne) pozicije u fjučersu su poznati kao *dugi hedževi* (*engl.* long hedge). Dugi hedževi se koriste kada kompanija zna da će morati da kupi određena sredstva u budućnosti i želi da sada zaključi cenu.

Pretpostavimo da je sada 15. januar. Proizvođač bakra zna da će mu 15. maja trebati 100.000 funti (lb) bakra da bi zatvorio određeni ugovor (1 funta ili libra = 453,59 g). Tržišna cena bakra je 340 centi po funti (lb), a cena fjučersa za isporuku u maju je 320 centi po funti (lb). Proizvođač može da hedžuje poziciju tako što će zauzeti dugu poziciju u četiri fjučersa na COMEX ogranku NYMEX-a i zatvoriti poziciju 15. maja. Svaki ugovor je na isporuku 25.000 funti bakra. Strategija je da se cena traženog bakra zaključi na iznos od blizu 320 centi po funti bakra. Pretpostavimo da je tržišna cena 325 centi po funti bakra na dan 15. maja. Kako je maj mesec dospeća fjučersa, to bi trebalo da bude veoma blizu cene fjučersa. Prema tome, proizvođač okvirno dobija

100.000 x (3.25 US$ - 3.20 US$) = 5.000 US$

za terminske ugovore (fjučerse). Za 100.000 funti bakra, po ceni od 3.25 centi po funti, dobija se 325.000 US$, gde je neto troškova približno 325.000 US$ - 5.000 US$ = 320.000 US$. U slučaju drugačijeg ishoda, uzmimo da je 15. maja tržišna cena 305 centi po funti. U tom slučaju, proizvođač gubi okvirno

100.000 x (3.20 US$ - 3.05 US$) = 15.000 US$

na fjučersima i plaća 100.000 funti bakra po ceni od 3.05, tako da dobija 305.000 US$ za bakar. Ponovo, neto troškovi iznose približno 320.000 US$, ili 320 centi po funti bakra.

Imajmo u vidu da je za kompaniju bolje da koristi fjučerse nego da 15. januara kupi bakar na promptnom (spot) tržištu. Ukoliko tako uradi, platiće 340 centi po funti umesto 320 centi i time će snositi i troškove kamate i troškove skladištenja. Za kompaniju koja redovno upotrebljava bakar, ova „mana" bi se neutralisala činjenicom da nam je bakar uvek pri ruci. Međutim, ako kompanija zna da joj bakar neće biti potreban sve do 15. maja, logičnije je da se koristi alternativa fjučersa.

Primeri koje smo ovde naveli pokazuju da se pozicija fjučersa zatvara (zaključuje) u mesecu isporuke. Ukoliko dođe do isporuke, hedž ima manje-više isti efekat. Međutim, samo isporučivanje ili preuzimanje isporuke može biti skupo i nezgodno. Iz tog razloga, obično se ne vrše isporuke, čak ni kada hedžer zadržava fjučers sve do meseca isporuke. Hedžeri sa dugim (kupovnim) pozicijama uglavnom izbegavaju bilo kakvu mogućnost preuzimanja zatvaranjem duge pozicije pre perioda isporuke (statistički je pokazano da samo 2% od ukupnog broja fjučersa bude izvršeno isporukom!). Takođe smo u ova dva primera pretpostavili da

Therefore, the company approximately receives

107.10 US$ - 103.10 US$ = 4 US$/bbl

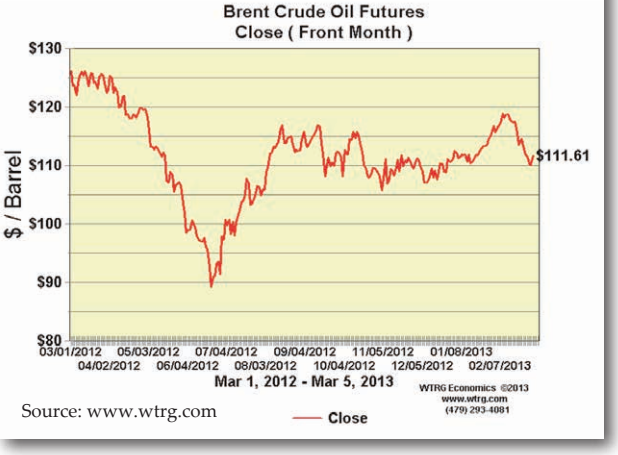
i.e. the company receives a total of 4 million US$ from its short position. The total sum achieved both from the futures position and from the sales contract is approx. 107.10 US$/bbl, or a total of 107.10 million US$.

In order to assess a different outcome, let us assume that the price of oil on the 15th of August was 114.10 US$/bbl. The company makes a profit of 114.10 US$ for oil and loses approximately

114.10 US$ - 107.10 US$ = 7 US$/bbl

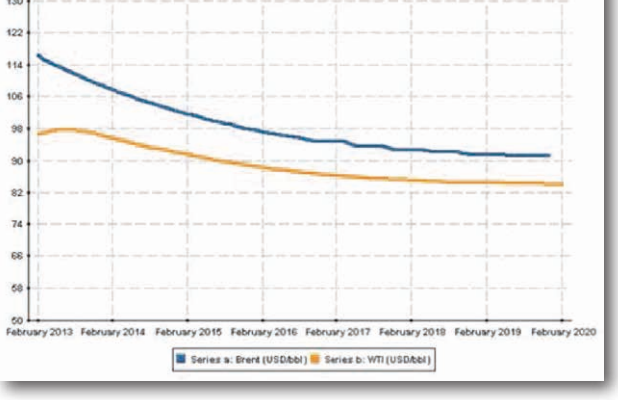
from the short position. Again, the total sum achieved is approximately 107.10 million US$. It is clearly seen here that in both cases the company has ended up with some 107 million US$.

Figure 1 Movement of futures prices for Brent Crude Oil on the NYMEX in the period March 2012 - March 2013



Source: www.wtrg.com

Figure 2 Projection of futures contracts price movement for the Brent Crude Oil and WTI for the period up to the year 2020



Short hedge covers those who are cultivating, storing, producing or distributing real goods. For example, an oil producer has a tanker of crude oil on route to a refinery and he is using a short hedge to protect his cargo from the price fall risk. Farmers storing wheat crops will also use short hedge in order to protect the price of their crop that they are saving in their storages. They all have in common the presence of risk from loss due to the fall in prices on the spot market (Andrijanic, 2002, p. 99).

Long hedge

When taking a long (buying) position in the futures contract, it is known as a **long hedge**. Long hedges are used when a company knows that it must buy certain assets in future but wishes to conclude the price now.

Let us assume that now is the 15th of January. Copper producer knows that on the 15th of May he will need 100,000 pounds (lb) of copper in order to close a certain contract (1 pound or libra = 453.59 g). The market price of copper is 340 cents per pound (lb), and the futures price for delivery in May is 320 cents per pound (lb). Producer can hedge his position by taking a long position in four futures on COMEX branch of NYMEX, and close the position with 15th of May. Every contract is made for the delivery of 25,000 pounds of copper. Strategy is to conclude the price of required copper on the amount of close to 320 cents per pound of copper. Let us assume that the market value is 325 cents per pound of copper on the day of 15th of May. As the month of May is the month of maturity for the futures contracts, this should be very close to the price of futures. Therefore, the producer approximately receives

100,000 x (3.25 US$ - 3.20 US$)
= 5,000 US$

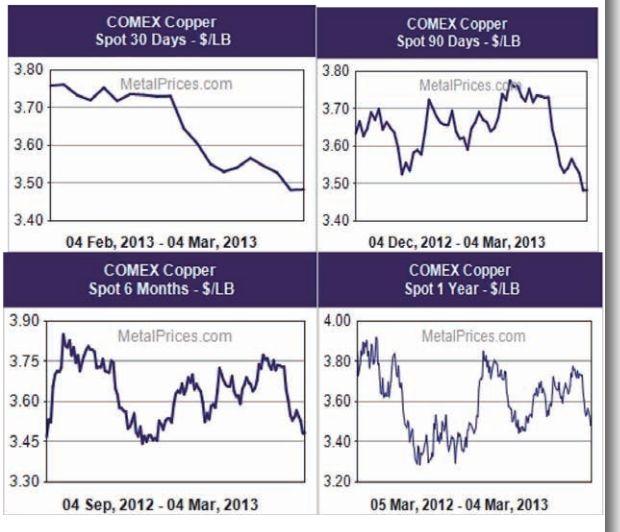
for the futures contracts. For 100,000 pounds of copper, at the price of 3.25 cents per pound, what is received is 325,000 US$, where net costs are approx. 325,000 US$ - 5,000 US$ = 320,000 US$. In the case of a different outcome, we take that on 15th of May the market price was 305 cents per pound. In that case, the producer loses approximately

100,000 x (3.20 US$ - 3.05 US$)
= 15,000 US$

on futures and pays 100,000 pounds of copper per price of 3.05, so that he gets 305,000 US$ for copper. Again, net costs amount approximately to 320,000 US$, or 320 cents per pound of copper.

nema dnevnog poravnanja. U praksi, dnevno poravnanje ima mali efekat na performanse hedža. Isplata fjučersa se realizuje svakodnevno za vreme trajanja ciklusa hedža, radije nego sve na kraju.

Slika 3. Kretanje cena bakra na COMEX-u za različita dospeća ugovora izraženo u US $/libri



Izvor: http://www.commoditiesforexnews.com/copper-charts/

Bazni rizik

Hedževi u do sada razmatranim primerima su bili skoro previše dobri da bi bili istiniti. Hedžer je bio u mogućnosti da odredi tačan datum u budućnosti kada će se sredstva kupiti ili prodati. U tom slučaju mu je bilo moguće da koristi fjučerse da bi uklonio skoro sve rizike koji mogu nastati od cene datih sredstava na taj datum. U praksi, hedžing u većini slučajeva nije tako konkretan. Nabrojaćemo neke od razloga:

1. Imovina čija cena treba da se zaštiti od rizika možda nije baš ista kao predmetna imovina fjučersa;
2. Hedžer može biti nesiguran u pogledu tačnog datuma kada će imovina biti kupljena ili prodata, i
3. Sam hedž može zahtevati da fjučersi budu zatvoreni pre meseca isporuke.

Ovi problemi dovode do stvaranja nečega što se zove *bazni rizik*. U nastavku će biti objašnjen njegov koncept.

Osnova ili baza (Basis)

Osnova (baza) u hedžing situaciji je sledeća (Hull, 2009, str. 51; Geman, 2007, str. 14):

Baza = Promptna cena imovine koja treba da se hedžuje - Cena upotrebljenog fjučersa[1]

ili

$$b_n = S_n - F_n$$

Ukoliko su imovina koja treba da se hedžuje i predmetna imovina fjučersa iste, osnova treba da bude nula na dan isteka roka fjučersa. Pre samog isteka roka, baza može biti pozitivna ili negativna.

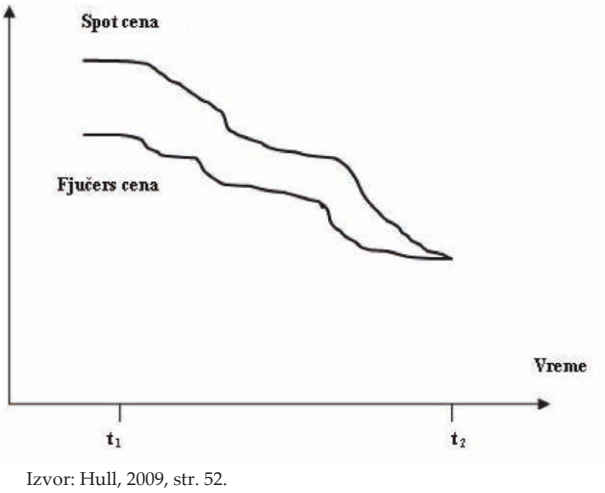
Vremenom, promptna (spot) cena i cena fjučersa se ne moraju menjati u istom iznosu. Kao rezultat, menja se baza. Povećanje baze se naziva *jačanje baze*, smanjenje baze se naziva *slabljenje baze*. Slika 4. prikazuje kako se baza vremenom može menjati u situaciji gde je baza pozitivna pre isteka fjučersa.

Da bi razmotrili prirodu baznog rizika, koristićemo sledeće oznake:

S_1 : Promptna cena u vremenu t_1
S_2 : Promptna cena u vremenu t_2
F_1: Cena fjučersa u vremenu t_1
F_2: Cena fjučersa u vremenu t_2
b_1: Baza u vremenu t_1
b_2: Baza u vremenu t_2

Pretpostavimo da je hedž postavljen u vremenu t_1 i zatvoren u vremenu t_2. Kao primer, razmotrićemo slučaj gde su promptne i cene fjučersa u vreme početka hedža $2.50 i $2.20, a u vreme zatvaranja hedža su $2.00, odnosno $1.90. To znači da $S_1 = 2.50$, $F_1 = 2.20$, $S_2 = 2.00$ i $F_2 = 1.90$.

Slika 4. Varijacija baze tokom vremena (konvergencija spot i fjučers cene)



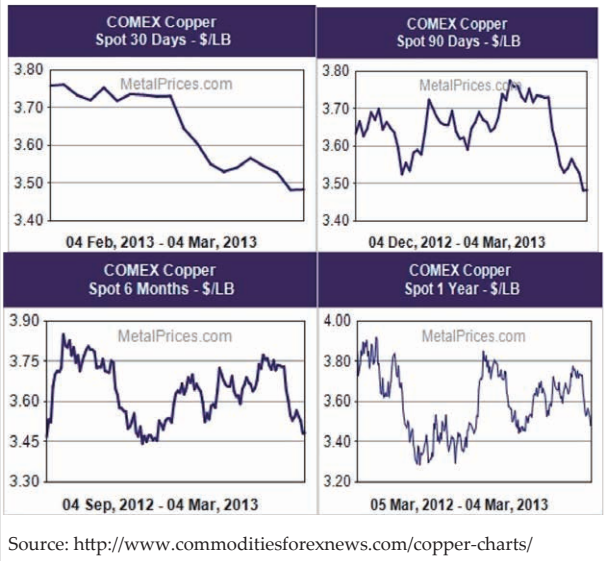
Izvor: Hull, 2009, str. 52.

1 Ovo je uobičajena definicija. Postoji i alternativna, Osnova = Cena fjučersa - Promptna cena, koja se ponekad koristi, posebno kad je predmet fjučersa finansijsko sredstvo.

Let us bear in mind that for the company it is better to use futures than to buy copper on 15th January on the spot market. If it should do so, it will pay 340 cents per pound instead of 320 cents and will thus bear also costs of interest and costs of storage. For the company which is a regular user of copper, this "drawback" would be neutralised by the fact that copper is always at hand. However, if the company knows that it will not need copper before 15th of May, it is more logical to use the futures alternative.

The cases that we have presented here show that the futures position is closed (concluded) in the month of delivery. If there should be a delivery, hedge has a more-or-less the same effect. However, the delivery itself or taking over of delivered goods can be costly and inconvenient. For this reason, deliveries are usually not made even when the hedger is keeping the futures all the time until the month of delivery. Hedgers in long (buying) positions are mostly avoiding any options of taking over, by closing long positions before the delivery period (statistics show that only 2% from the total number of futures are executed in a delivery!). In addition, we have also assumed, in these two cases, that there is no daily settlement. In practice, daily settlement has a small effect on the hedge performance. The payment of futures is done on daily basis for the duration of the hedging cycle, rather than total payment made at its end.

Figure 3 Movement of COMEX spot copper prices for different maturities of futures contracts, expressed in US$/ pound



Source: http://www.commoditiesforexnews.com/copper-charts/

Basis risk

Hedges presented in the above cases were almost too good to be true. Hedger was in the position to determine exact date in the future when the assets will be bought or sold. In such a case, he was able to use futures in order to eliminate almost all the risks that may arise from the price of given assets on that date. In practice, however, hedging in most cases is not so concrete. Let us list some of the reasons:

1. Assets whose price is to be protected from risk may not be exactly the same as the assets that are subject to the futures contract;
2. Hedger may not be sure regarding the exact date when the assets will be bought or sold; and
3. The hedge itself may require futures to be closed prior to the month of delivery.

These problems are leading to the creation of something that is called the *basis risk.* We shall explain its concept further in this paper.

Base or Basis

Basis in the hedging situation is the following (Hull, 2009, p. 51; Geman, 2007, p. 14):

Basis = Spot price of asset to be hedged - Price of futures used[1]

or

$$b_n = S_n - F_n$$

If the asset to be hedged and the futures subject asset is the same, the basis should be zero on the date when the term of futures contract expires. Prior to the expiry of the term, the basis may be either positive or negative.

In time, the spot price and the price of futures do not have to be changed in the same amount. As a result, what changes is the basis. Increase of basis is called *basis strengthening;* decrease of basis is called *basis weakening*. **Figure 4** shows how can the basis be changed in time in the situation where the basis is positive prior to the expiry of the futures.

In order to examine the nature of the basis risk, we shall use the following symbols:

S_1 : Spot price in time t_1

S_2 : Spot price in time t_2

1 This is the usual definition. There is also an alternative, Basis = Futures price - Spot price, which is sometimes used, especially when the subject of futures is a financial asset.

Iz definicije baze, imamo

$$b_1 = S_1 - F_1 \text{ i } b_2 = S_2 - F_2$$

tako da, u našem primeru, $b_1 = 0.30$ i $b_2 = 0.10$.

Razmotrimo prvo situaciju hedžera koji zna da će imovina biti prodata u vremenu t_2 i uzima kratku poziciju fjučersa u vremenu t_1. Ostvarena cena za imovinu je S_2 i profit za fjučers je $F_1 - F_2$. Efektna cena koja sa dobija imovinom sa hedžingom je prema tome

$$S_2 + F_1 - F_2 = F_1 + b_2$$

U ovom našem primeru, to je \$2.30. Vrednost F_1 je poznata u vremenu t_1. Kada bi i b_2 takođe bila poznata u tom vremenu, to bi rezultiralo savršenim hedžom. Rizik hedžinga je nesigurnost povezana sa b_2 i poznata je kao *bazni rizik*. Razmotrimo sledeću situaciju gde kompanija zna da će kupiti imovinu u vremenu t_2 i započinje dugi hedž u vremenu t_1. Cena plaćena za imovinu je S_2 a gubitak na hedžu je $F_1 - F_2$. Efektivna cena koja se hedžingom plaća je prema tome

$$S_1 + F_1 - F_2 = F_1 + b_2$$

Ovo je isti izraz kao i u prethodnom primeru i iznosi \$2.30. Vrednost F_1 je poznata u vremenu t_1, a b_2 predstavlja bazni rizik.

Možemo primetiti da bazni rizik može dovesti do poboljšanja ili pogoršanja pozicije hedžera. Uzmimo na primer kratki hedž. Ukoliko baza ojača (tj. poveća se) neočekivano, poboljšava se i pozicija hedžera; ukoliko baza oslabi (tj. opadne) neočekivano, pozicija hedžera se pogoršava. Za dugi hedž važi sasvim suprotno. Ako baza neočekivano ojača, pozicija hedžera se pogoršava; ukoliko baza neočekivano slabi, pozicija hedžera se poboljšava.

Imovina koja dovodi do izloženosti hedžera je ponekad drugačija od imovine koja je predmet fjučersa koji se koristi za hedžing. Ovo povećava bazni rizik. Definišimo S^*_2 kao cenu predmetne imovine fjučersa u vremenu t_2. Kao i pre, S_2 je cena imovine koja se hedžuje u vremenu t_2. Hedžingom, kompanija se obezbeđuje da cena koja će biti plaćena (ili primljena) za imovinu iznosi

$$S_2 + F_1 - F_2$$

To se može napisati kao

$$S_2 + F_1 - F_2$$

Izrazi $S^*_2 - F_2$ i $S_2 - S^*_2$ predstavljaju dve komponente baze. Prvi izraz je baza koja bi postojala kada bi imovina koja se hedžuje bila ista kao i predmetna imovina fjučersa. Drugi izraz je baza koja proizilazi iz razlike između te dve imovine.

Izbor terminskog ugovora

Jedan od ključnih faktora koji utiču na bazni rizik jeste izbor terminskog ugovora koji će se koristiti za hedžing. Ovaj izbor se sastoji od dve komponente:

1. izbor predmetne imovine terminskog ugovora
2. izbor meseca dospeća

Ukoliko se imovina koja se hedžuje potpuno poklapa sa predmetnom imovinom fjučersa, prvi izbor je prilično lak. U drugom slučaju, neophodno je izvšiti temeljnu analizu da bi se odredilo koji od pristupačnih terminskih ugovora ima cene fjučersa koje su u najbližoj korelaciji sa cenom imovine koja se hedžuje.

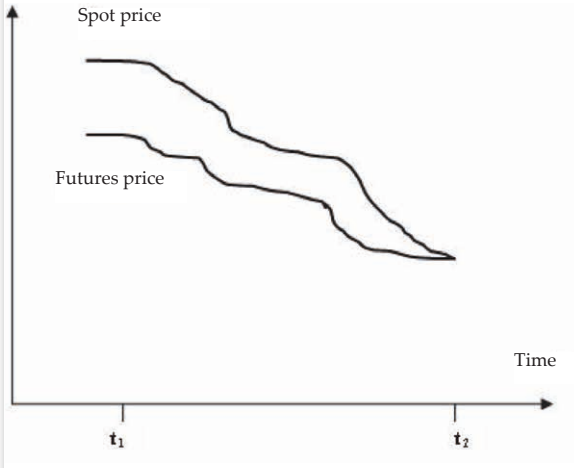
Na izbor meseca dospeća će verovatno uticati nekoliko faktora. U primerima koje smo prethodno dali u ovom radu, pretpostavili smo da je, kada istek hedža odgovara mesecu dospeća, izabran ugovor sa tim mesecom dospeća. U stvari, u takvim uslovima se obično bira ugovor sa kasnijim mesecom dospeća. Razlog za to je što su u nekim slučajevima cene fjučersa prilično čudne za vreme meseca dospeća. Štaviše, dugi hedž snosi rizik preuzimanja fizičke imovine ukoliko je ugovor zadržan za vreme meseca dospeća. Preuzimanje isporuke može biti skupo i nezgodno (dugi hedževi uglavnom preferiraju da zatvore fjučers i kupe imovinu od svog uobičajenog snabdevača).

Uopšteno, bazni rizik se povećava kako raste vremenska razlika između isteka hedža i meseca dospeća. Jednostavno pravilo je da se izabere mesec dospeća koji je što je bliže moguće, ali kasnije od isteka hedža. Pretpostavimo da su meseci dospeća mart, jun, septembar i decembar za fjučerse na određenu imovinu. Za istek hedža u decembru, januaru i februaru, izabraće se martovski ugovor; za istek hedža u martu, aprilu i maju, izabraće se junski ugovor i tako redom. Ovo prosto pravilo pretpostavlja da ima dovoljno likvidnosti u svim ugovorima da bi se ispunili zahtevi hedžera. U praksi, likvidnost je najveća u fjučersima koji brzo dospevaju. Prema tome, u nekim situacijama, hedžer mora da koristi fjučerse sa kratkim rokom dospeća i da ih prosleđuje dalje.

F_1: Futures price in time t_1
F_2: Futures price in time t_2
b_1: Basis in time t_1
b_2: Basis in time t_2

Let us assume that the hedge was made in time t_1 and that it was closed in time t_2. As an example, we shall examine the case where the spot prices and the futures prices in the beginning of the hedge are \$2.50 and \$2.20, and at the time of closing the hedge they are \$2.00 and \$1.90. This means that the S_1 = 2.50, F_1 = 2.20, S_2 = 2.00, and F_2 = 1.90.

Figure 4 Variation of the basis over time (spot price and futures price convergence)



Source: Hull, 2009, p. 52.

From the definition of the basis we have the following

$$b_1 = S_1 - F_1 \text{ i } b_2 = S_2 - F_2$$

so that in our example b_1 = 0.30, and b_2 = 0.10.

Let us first examine the situation of the hedger who knows that the asset will be sold in time t_2 and takes a short futures position in time t_1. The price for assets obtained is S_2 and profit for futures is $F_1 - F_2$. The effective price obtained from asset with hedging, therefore, is the following

$$S_2 + F_1 - F_2 = F_1 + b_2$$

In this our example, this is \$2.30. The value F_1 is known in time t_1. If the b_2 would also be known in this time, it would result in a perfect hedge. The hedging risk is the uncertainty connected with the b_2, and is known as the *basis risk*. Let us examine the following situation, where the company knows that it will buy an asset in time t_2 and starts a long hedge in time t_1. The price paid for the asset is S_2, and the loss on the hedge is $F_1 - F_2$. The effective price which is paid with hedging, therefore, is the following

$$S_1 + F_1 - F_2 = F_1 + b_2$$

This is the same expression as in the previous example, and amounts to \$2.30. The value of F_1 is known in time t_1, and the b_2 represents the basic risk.

It should be mentioned that the basis risk may bring about improvement or deterioration of the hedger's position. Let us take the case of a short hedge. If the basis is strengthening (i.e. increasing) unexpectedly, the hedger's position is also improving; if the basis is weakening (i.e. falling), the position of hedger is deteriorating. For a long hedge, the opposite situation applies. If the basis is unexpectedly strengthening, the hedger's position is deteriorating; if the basis is unexpectedly weakening, the position of hedger is improving.

The asset which is leading to the hedger's exposure is sometimes different from the asset which is the subject of the futures contract which is being used for hedging. This is increasing the basis risk. Let us define S^*_2 as the price of the given futures asset in time t_2. As in the previous situation, S_2 is the price of asset which is being hedged in time t_2. By hedging, the company is insuring that the price which will be paid (or received) for the asset will be the following

$$S_2 + F_1 - F_2$$

This can be written as follows

$$S_2 + F_1 - F_2$$

Expressions $S^*_2 - F_2$, and $S_2 - S^*_2$ are the two components of the basis. The first expression is the basis which existed when the asset which is hedged was the same as the asset subject of the futures contract. The second expression is the basis which derived from the difference between these two assets.

Selection of the futures contract

One of the key factors impacting the basis risk is the selection of the futures contract which is to be used for hedging. This selection consists of the two components:

1. Selection of the asset subject of the futures contract;
2. Selection of the month of maturity.

If the asset which is hedged is fully matched

Unakrsni hedžing (cross hedge)

U primerima koje smo razmotrili, predmetna imovina ugovora je bila ista kao i imovina čija se cena štitila. *Unakrsni hedžing* se javlja kada su u pitanju dve različite imovine. Uzmimo za primer jednu avio-kompaniju koja se brine u vezi budućih cena mlaznih goriva. Kako za mlazna goriva nema fjučersa, može izabrati da koristi fjučerse lož-ulja da bi zaštitila svoju izloženost riziku.

Hedž pokazatelj je pokazatelj veličine pozicije zauzete u fjučersu u odnosu na veličinu izloženosti. Kada je predmetna imovina fjučersa i imovina koja se hedžuje ista, prirodno je koristiti hedž pokazatelj 1.0. Kada se koristi unakrsni hedžing, određivanje pokazatelja hedža koji je jednak 1.0 nije uvek optimalno rešenje. Hedžer treba da koristi vrednost hedž pokazatelja koja minimalizuje varijansu vrednosti hedžovane pozicije. Sada ćemo razmotriti kako hedžer to može da uradi.

Izračunavanje minimalne varijanse hedž pokazatelja

Koristićemo sledeće izraze:

ΔS: Promena u promptnoj ceni, S, za vreme perioda trajanja hedža

ΔF: Promena u ceni fjučersa, F, za vreme perioda trajanja hedža

σ_S : Standardna devijacija ΔS

σ_F:: Standardna devijacija ΔF

ϱ: Koeficijent korelacije između ΔS i ΔF

h^*: Hedž pokazatelj koji minimalizuje varijansu pozicije hedžera

pokazaćemo da je

$$h^* = \varrho \frac{\sigma_S}{\sigma_F}$$

Optimalan pokazatelj je proizvod koeficijenta korelacije između ΔS i ΔF i pokazatelja standardne devijacije ΔS u odnosu na standardnu devijaciju ΔF. Na **Slici 5.** je prikazano kako varijansa vrednosti pozicije hedžera zavisi od izabranog hedž pokazatelja.

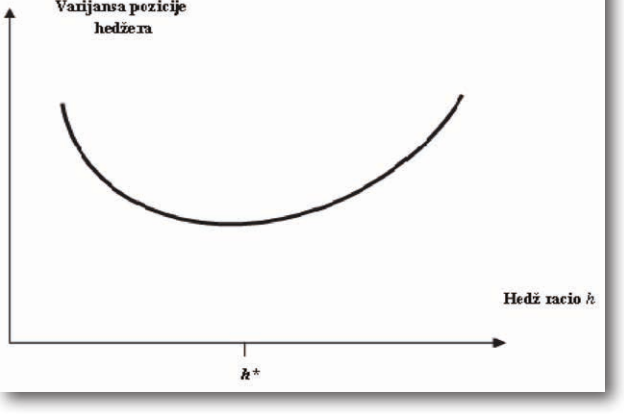
Ako je $\varrho = 1$, a $\sigma_F = \sigma_S$, hedž pokazatelj, h^*, je 1.0. Taj rezultat je za očekivanje, zato što su u ovom slučaju cene fjučersa savršeno ogledalo promptnim cenama. Ako je $\varrho = 1$, a $\sigma_F = 2\sigma_S$, hedž pokazatelj h^* će biti 0.5. Ovo je takođe očekivani rezultat, jer se u ovom slučaju cene fjučersa menjaju dvaput više u odnosu na promptne cene.

Optimalni pokazatelj, h^*, je krivulja ogovarajuće linije kada je ΔS u regresiji prema ΔF, kao što je pokazano na **Slici 6.** Ovo je uglavnom logično, jer nam je potrebno da h^* odgovara pokazatelju promena u ΔS u odnosu na promene u ΔF. *Efektivnost hedža* se može definisati kao proporcija varijanse koja je hedžingom eliminisana. Ovo je R^2 od regresije ΔS u odnosu na ΔF i jednako je ϱ^2, ili

$$h^{*2} \frac{\sigma_F^2}{\sigma_S^2}$$

Parametri u ovoj jednačini se uglavnom procenjuju na bazi istorijskih podataka ΔS i ΔF (Implikativno je da će budućnost na neki način biti kao i prošlost). Bira se određen broj nepreklapajućih vremenskih intervala, i posmatraju se vrednosti ΔS i ΔF za svaki pojedinačni posmatrani interval. Idealno, dužina svakog vremenskog intervala je ista kao i dužina vremenskog intervala trajanja hedža. U praksi, ovo ponekad ozbiljno ograničava broj posmatranja koja su pristupačna, i koristi se kraći vremenski period.

Slika 5. Zavisnost varijanse pozicije hedžera od izabranog hedž pokazatelja



with the asset subject of the futures contract, the first choice is rather easy. In the second case it is necessary to make a thorough analysis in order to determine which one of the available futures contracts is having the futures prices in the closest correlation with the price of the assets that is being hedged.

The selection of the maturity month will probably depend on several factors. In the examples that we have previously given in this paper, we have assumed that, when the expiry of hedge corresponds to the month of maturity, the selected contract was the one with that month of maturity. In actual fact, in such cases what is usually chosen is the contract with the later month of maturity. The reason for this is that in some cases prices of futures are rather strange during the month of maturity. Furthermore, the long hedge bears the risk of taking over physical assets if the contract is held during the time of the month of maturity. Taking over of the delivery may be costly and inconvenient (long position hedges are mostly preferring closing out the futures and buying assets from their usual supplier).

Generally speaking, the basis risk is increasing as the time difference grows between the expiry of hedge and the month of maturity. The simple rule is to select the maturity month which is as close as possible, but later than the hedge expiry. Let us assume that the maturity months are March, June, September, and December for the futures on a certain asset. For the expiry of hedge in December, January, and February, the chosen futures contract will be the March one; for the expiry of hedge in March, April and May the selected futures contract will be the June one, and so on. This simple rule assumes that there is sufficient liquidity in all the contracts in order to satisfy the requirements of the hedger. In practice, liquidity is the highest in futures which are maturing fast. Therefore, in some situations, hedger must use futures with short maturity terms and send them further on.

Cross hedge

In the examples that we have examined, the asset subject of futures contract was the same as the asset whose price was protected. *Cross hedge* appears when it is the case of two different assets. Let us take the case of an air-carrier with concerns over the future price of jet fuel. As there are no futures for the jet fuel, the company can use futures for heating oil in order to protect its risk exposure.

Hedge indicator is an indicator designating the size of the position taken in the futures in respect to the size of exposure. When the relevant futures asset and hedging asset are one and the same, it is natural to use the hedge indicator of 1.0. When using cross hedge, determination of the hedge indicator which is equal to 1.0 is not always an optimum solution. Hedger should use the value of hedge indicator that is minimizing variance of the hedged position value. We shall now examine the way in which the hedger can accomplish this.

Calculation of the minimal hedge indicator variance

We shall use the following expressions:

ΔS: Change in the spot price, S, for the duration of the hedge period

ΔF: Change in the price of futures, F, for the duration of the hedge period

σ_S: Standard deviation ΔS

σ_F: Standard deviation ΔF

p: ΔS and ΔF correlation ratio

h^*: Hedge indicator minimizing hedger's position variance

We will show the following:

$$h^* = \varrho \frac{\sigma_S}{\sigma_F}$$

The optimum indictor is the product of correlation ratio between ΔS and ΔF and the indicator of standard ΔS in respect to the standard deviation ΔF. Figure 5 shows how the hedger's position variance value depends on the selected hedge indicator.

If p = 1, and $\sigma_F = \sigma_S$, hedge indicator, h^*, is equal to 1.0. This result was to be expected because in this case the futures prices are a perfect mirror reflecting spot prices. If p = 1, and $\sigma_F = 2\sigma_S$, hedge indicator h^* will be 0.3. This is also an expected result, because in this case futures prices are changing twice as much in respect to the spot prices.

The optimum indicator, h^*, is the curve

Slika 6. Regresija promene spot cene prema ceni fjučersa

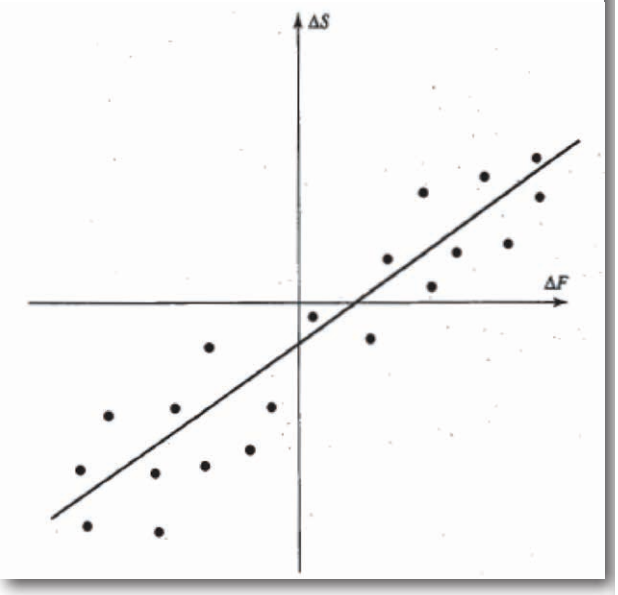


Tabela 1. Podaci za izračunavanje minimuma varijanse hedž racia (fjučersi lož-ulja i promene cena mlaznog goriva)

Mesec *i*	Promena fjučers cene po galonu (x_i)	Promena cene goriva po galonu (y_i)
1	0.021	0.029
2	0.035	0.020
3	-0.046	-0.044
4	0.001	0.008
5	0.044	0.026
6	-0.029	-0.019
7	-0.026	-0.010
8	-0.029	-0.007
9	0.048	0.043
10	-0.006	0.011
11	-0.036	-0.036
12	-0.011	-0.018
13	0.019	0.009
14	-0.027	-0.032
15	0.029	0.023

Optimalan broj ugovora za hedžing

Definišimo potrebne varijable na sledeći način:

Q_A - Veličina hedžovane pozicije (jedinice)

Q_F - Veličina jednog fjučersa (jedinice)

N^* - Optimalan broj fjučersa za hedžing

Fjučersi treba da budu h^*Q_A jedinicama imovine. Broj potrebnih fjučersa je dat kao

$$N^* = \frac{h^* Q_A}{Q_F}$$

Izračunavanje optimalnog broja ugovora prikazaćemo na primeru koji sledi. Aviokompanija očekuje da kupi 2 miliona galona mlaznog goriva za mesec dana i odlučuje da koristi lož-ulje za hedžing*. Pretpostavimo Tabela 1. da je, za narednih 15 meseci, podatke o promenama cena mlaznog goriva po galonu, ΔS, i odgovarajućim promenama cena fjučersa lož-ulja koji će biti korišćeni za hedžing promena cena u toku meseca, ΔF. Broj posmatranja, koje označavamo sa n, je 15. Posmatranja ΔF su označena sa x_i, a ΔS posmatranja su označena sa y_i. Iz Tabele 1, imamo:

$$\sum x_i = -0.013 \qquad \sum x_i^2 = 0.0138$$

$$\sum y_i = 0.003 \qquad \sum y_i^2 = 0.0097$$

$$\sum x_i y_i = 0.0107$$

Standardne statističke formule daju sledeću procenu σ_F :

$$\sqrt{\frac{\sum x_i^2}{n-1} - \frac{(\sum x_i)^2}{n(n-1)}} = 0.0313$$

procena za σ_S:

$$\sqrt{\frac{\sum y_i^2}{n-1} - \frac{(\sum y_i)^2}{n(n-1)}} = 0.0263$$

procena za ρ:

$$\frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{\left[n\sum x_i^2 - (\sum x_i)^2\right]\left[n\sum y_i^2 - (\sum y_i)^2\right]}} = 0.928$$

Minimalna varijansa hedž pokazatelje, h^*, je prema tome:

0.928 x 0.0263 / 0.0313 = 0.78

Svaki ugovor sa lož-uljem kojim se trguje na NYMEX je na 42.000 galona lož-ulja. Iz jednačina, optimalan broj ugovora je sledeći:

0.78 x 2.000.000 / 42.000 = 37.14

ili, zaokruženo na najbliži ceo broj, 37.

Praćenje ili podešavanje hedža

Kada se za hedžing koriste fjučersi, mala podešavanja, poznatija kao *praćenje hedža*, moraju se uraditi da bi se dozvolio uticaj dnevnog poravnanja. To u praksi znači da

of the corresponding line when the ΔS is in regression towards ΔF, as shown in Figure 6. This is mainly a logical conclusion as we need the h^* to correspond to the indicator of changes in the ΔS in respect to the changes in ΔF. *Hedge efficiency* can be defined as a proportion of the variance which was eliminated through hedging. This is the R^2 of the regression ΔS in respect to the ΔF and is equal to p^2, or

$$h^{*2}\frac{\sigma_F^2}{\sigma_S^2}$$

Parameters in this equation are mainly estimated on the basis of historical data of ΔS and ΔF (implicating that the future will in some way be the same as the past). A certain number of time intervals that are not overlapping is chosen, and the values of ΔS and ΔF are observed for each individual interval under observation. Ideally, the length of every time interval is the same as the length of the time interval for the hedge duration. In practice, however, this is at times seriously limiting the number of observations that are accessible, and a shorter time period is being used.

Figure 5 Dependence of hedger position variance on the selected hedge indicator

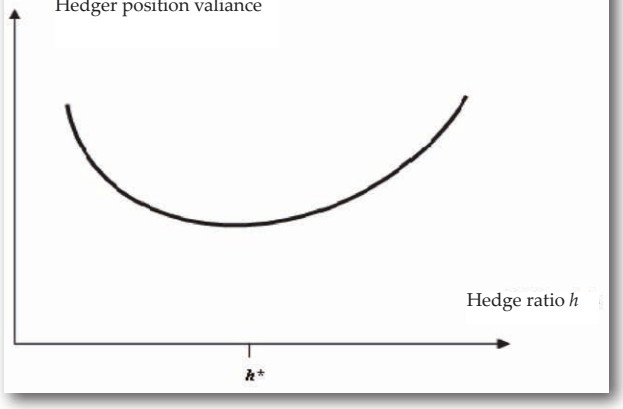
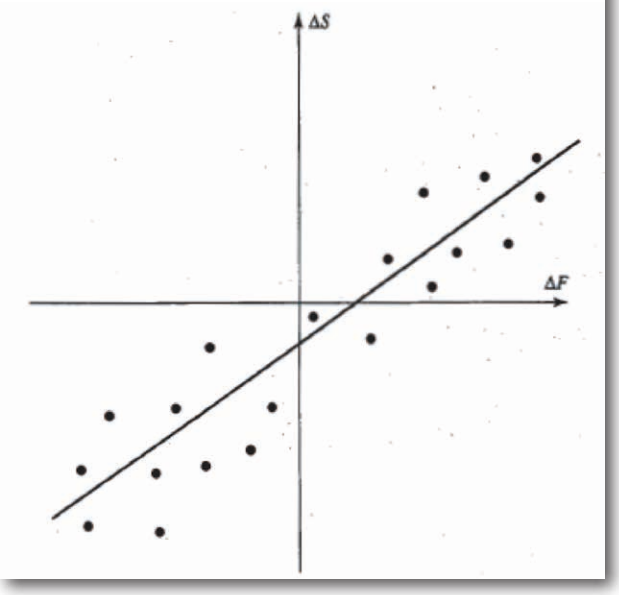


Figure 6 Regression of spot price change in respect to the price of futures



Optimum number of hedging contracts

Let us define the necessary variables in the following way:

Q_A - Size of position hedged (unit)

Q_F - Size of one futures (unit)

N^* - Optimum number of futures for hedging

Futures should be h^*Q_A to the units of assets. The necessary number of futures is given in the following form:

$$N^* = \frac{h^*Q_A}{Q_F}$$

Calculation of the optimum number of contracts will be presented in the following example. Airline company is expecting to buy 2 million gallons of jet fuel in a one-month time and decides to use heating oil for hedging*. Let us assume, in Table 1, that for the forthcoming 15 months, data on changes in prices of jet fuel per gallon is ΔS, and the corresponding changes in prices of futures for heating oil to be used for hedging the change in prices over one month's time is ΔF. The number of observations that we designate with n, is 15. Observations of the ΔF are marked with x_i, and the observations of ΔS are marked with y_i. From Table 1 we have the following:

imamo sledeću relaciju:

$$N^* = \frac{h * V_A}{V_F}$$

gde je V_A vrednost dolara za hedžovanu poziciju a V_F vrednost dolara za jedan fjučers (cena fjučersa puta Q_F). Pretpostavimo da je iz prethodnog primera promptna cena 1.94, a cena fjučersa 1.99 dolara za galon. Onda je V_A = 2.000.000 x 1.94 = 3.880.000, dok je V_F = 42.000 x x1.99 = 83.580, tako da je optimalni broj ugovora:

0.78 x 3.880.000 / 83.550 = 36.22

Ako ga zaokružimo na najbliži ceo broj, optimalan broj ugovora je sada 36, radije nego 37. Efekat praćenja hedža je da se uveća pokazatelj hedža u jednačini pokazateljem promptne cene u odnosu na cene fjučersa. U idealnim uslovima, pozicija fjučersa koja se koristi za hedžing treba da se prilagođava kako se V_A i V_F menjaju, ali u praksi to uglavnom nije izvodljivo.

Argumenti za i protiv hedžinga

Argumenti koji govore u prilog hedžingu su toliko očiti, da teško da ih uopšte treba posebno i nabrajati. Većina kompanija koje se bave proizvodnjom, maloprodajom, velikoprodajom ili pružanjem usluga nemaju neke posebne veštine i stručnosti u predviđanju varijabli kao što su kamatne stope, kursne razlike i cene robe. Njima je logično da hedžuju rizike koji su vezani za ove varijable onim redom kojim se pojavljuju. Tako se kompanije mogu fokusirati na svoje osnovne aktivnosti, za koje pretpostavljamo da imaju i posebne veštine i stručnosti. Putem hedžinga, one izbegavaju neprijatna iznenađenja kao što su drastični skokovi cena roba koje se kupuju i potrebne su za ostvarivanje tekućih poslova. U praksi, mnogi rizici se ostavljaju bez zaštite. U daljem tekstu ispitujemo neke od ovih razloga.

Hedžing i akcionari

Jedan argument koji se ponekad ističe je da akcionari, ukoliko to žele, mogu sami da se bave hedžingom (zaštitom od rizika). Nije potrebno da to umesto njih radi kompanija. Međutim, taj argument je otvoren za diskusiju. Pretpostavlja se da su akcionari, u istoj meri kao i menadžment kompanije, upoznati sa svim onim informacijama o riziku sa kojim se kompanija suočava. Ali, u većini slučajeva, ovo nije tačno. Taj argument takođe ignoriše akviziciju (komisiju) i druge troškove transakcije, koji su za velike transakcije jeftiniji nego za male. Logično, hedžing će biti jeftiniji kad se vrši od strane kompanije, nego od strane pojedinačnih akcionara. Sve u svemu, veličina fjučersa čini hedžing od strane pojedinačnih akcionara nemogućim u mnogim situacijama.

Jedna stvar koju akcionari mogu da urade, i to mnogo lakše nego kompanije, je da diversifikuju rizik. Akcionar sa dobro diversifikovanim portfolijom može biti imun na mnoge rizike sa kojima se suočava kompanija. Na primer, pored posedovanja akcija u kompaniji koja koristi bakar, dobro diversifikovani akcionar može posedovati akcije i u proizvodnji bakra, tako da je sveobuhvatna izloženost ceni bakra veoma mala. Ukoliko kompanije rade u najboljem interesu dobro diversifikovanih akcionara, sporna je primena hedžinga u mnogim situacijama. Međutim, do koje krajnosti utiče ovaj argument na menadžere u praksi je otvoreno pitanje.

Hedžing i konkurenti

Ukoliko hedžing kao takav ne predstavlja normu u određenoj industriji, za kompanije i nije logično da odstupaju od drugih. Pritisci konkurencije u okviru industrije mogu biti takvi da cene robe u toj oblasti variraju toliko da se reflektuju na troškove sirovina, kamatnih stopa, kursne razlike, itd. Kompanija koja se ne štiti od rizika može očekivati da profitna marža okvirno bude konstantna. Međutim, kompanija koja se štiti od rizika, može očekivati da njena profitna marža oscilira!

Da bi ovo objasnili, uzmimo u razmatranje dva proizvođača zlatnog nakita, *Safe and Sure* kompaniju i *Take a Chance* kompaniju (Hull., 2009, str. 49). Pretpostavimo da se većina kompanija u toj grani ne štiti od promena cena zlata i da kompanija *Take a Chance* nije izuzetak. Međutim, Safe and Sure kompanija je rešila da bude drugačija od svojih konkurenata i da koristi fjučerse da bi u toku narednih 18 meseci zaštitila svoje nabavke zlata. Ukoliko cena zlata raste, ekonomski pritisak će nastojati da dovede do odgovarajućeg porasta velikoprodajne cene

$$\sum x_i = -0.013 \qquad \sum x_i^2 = 0.0138$$

$$\sum y_i = 0.003 \qquad \sum y_i^2 = 0.0097$$

$$\sum x_i y_i = 0.0107$$

Table 1 Data for calculating minimum variance of hedge ratio (heating oil futures and changes in jet fuel prices)

Month *i*	Change in futures price per gallon (x_i)	Change in fuel price per gallon (y_i)
1	0.021	0.029
2	0.035	0.020
3	-0.046	-0.044
4	0.001	0.008
5	0.044	0.026
6	-0.029	-0.019
7	-0.026	-0.010
8	-0.029	-0.007
9	0.048	0.043
10	-0.006	0.011
11	-0.036	-0.036
12	-0.011	-0.018
13	0.019	0.009
14	-0.027	-0.032
15	0.029	0.023

Standard statistical formulae give the following estimates of σ_F:

$$\sqrt{\frac{\sum x_i^2}{n-1} - \frac{(\sum x_i)^2}{n(n-1)}} = 0.0313$$

estimates for σ_S:

$$\sqrt{\frac{\sum y_i^2}{n-1} - \frac{\left(\sum y_i\right)^2}{n(n-1)}} = 0.0263$$

estimates for p:

$$\frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{\left[n\sum x_i^2 - \left(\sum x_i\right)^2\right]\left[n\sum y_i^2 - \left(\sum y_i\right)^2\right]}} = 0.928$$

Minimal variance of hedge indicator, h^*, therefore, is the following:

0.928 x 0.0263 / 0.0313 = 0.78

Every heating oil contract traded on the NYMEX was for 42,000 gallons of heating oil. The equations show that the optimum number of contracts is the following:

0.78 x 2.000.000 / 42.000 = 37.14

or, rounded up to the nearest whole number, 37.

Hedge follow up or adjustment

When futures are used for hedging, slight adjustments, known as the *hedge follow up*, must be made in order to allow for the impact of the daily settlement. This in practice means that we have the following relation:

$$N^* = \frac{h^* V_A}{V_F}$$

where V_A is the value in US$ for the hedged position, and V_F is the value in US$ for one futures (price of futures times Q_F). Let us assume that in our previous example the spot price is 1.94, and the price of futures is 1.99 US$ per gallon. Then the V_A = 2,000,000 x 1.94 - 3,880,000, while V_F = 42,000 x x1.99 = 83,580, so that the optimum number of contracts is the following:

0.78 x 3.880.000 / 83.550 = 36.22

If we are to round up this to the nearest whole number, the optimum number of contracts is now 36, rather than 37. The effect of the follow up of the hedge is to increase the hedge indicator in the equation through the indicator of the spot price in respect to the futures price. In ideal conditions, futures position used for hedging should be adjusted, as the V_A and V_F are changing, but in practice this is most often impossible to implement.

Arguments pro and contra hedging

Arguments speaking in favor of hedging are so obvious that it is hardly necessary to enumerate them at any length. Most of the companies engaged in production, retail sales, wholesale, or service providers do not have any special skills or expertise for predicting variables such as the interest rate, exchange rate disparities and prices of goods. It is logical for them to hedge against risks related to these variables in such an order in which they appear. Hence the companies may focus on their basic activities for which we presume that they have

nakita, tako da profitna marža Take a Chance kompanije ostaje nepromenjena. Nasuprot tome, profitna marža kompanije Safe and Sure će porasti kada se uzmu u obzir efekti zaštite od rizika. Ukoliko cena zlata padne, ekonomski pritisak će imati tendenciju da dovede do odgovarajućeg pada velikoprodajne cene nakita. Ponovo, profitna marža Take a Chance kompanije ostaje nepromenjena. Međutim, profitna marža Safe and Sure kompanije ide na dole. U ekstremnim slučajevima, njena profitna marža može biti negativna, kao rezultat izvršenog „hedžinga"! Situacija je objašnjena u Tabeli 2.

Ovaj primer naglašava značaj posmatranja celokupne slike prilikom hedžinga. Da bi se kreirala hedžing strategija za zaštitu od promena cena, treba uzeti u obzir sve implikacije promene cena na profitabilnost kompanije.

Tabela 2. Opasnost od hedžinga kada konkurencija ne „hedžuje"

Promena cene zlata	Efekat na cenu zlatnog nakita	Efekat na profit Take a Chance Co.	Efekat na profit Sure and Safe Co.
Porast	Porast	Nema	Porast
Pad	Pad	Nema	Pad

Zaključak

Hedžing je investicija koja služi da smanji ili ukine rizik koji se odnosi na neku drugu investiciju. Hedžing je kreiran da minimizira izlaganje nepoželjnom poslovnom riziku, ali takođe dozvoljava i da se profitira od te investicije. Hedžing je mehanizam - strategija za smanjenje mogućih gubitaka u realnom poslovanju kompanije. Kompanija mora u potpunosti biti sigurna u svoje potrebe i da poseduje godišnji plan poslovanja, jer izbor pogrešnog instrumenta zaštite od rizika može imati negativne efekte umesto pozitivnih. Prednost finansijskih derivativa u odnosu na instrumente iz kojih su izvedeni jeste: veća fleksibilnost u zaštiti pozicije, vanbilansnoj evidenciji i plaćanju razlike u ceni, što znači da se glavnica ne razmenjuje i, shodno tome, rizik je manji od transakcija kod kojih se vrši razmena glavnice a koje se odnose na instrumente iz kojih su finansijski derivativi izvedeni. Za pravilno korišćenje hedžinga, neophodno je imati pravilnu strategiju, koja je zasnovana na realnom mesečnom /kvartalnom ili godišnjem poslovanju privrednog subjekta.

U ovom radu smo predstavili različite načine kojima kompanija zauzimanjem pozicije sa fjučersima može da nadoknadi (poravna) izloženost riziku promene cena imovine. Ako je izloženost takva da kompanija dobija kada cena imovine raste i gubi kad cena imovine pada, kratki hedž je sasvim odgovarajući. Ukoliko je izloženost suprotna (tj. kompanija dobija kad cena imovine pada i gubi kad cena imovine raste), prigodniji je dugi hedž.

Hedžing je način smanjivanja rizika. Kao takav, trebalo bi da je oberučke dočekan od strane menadžmenta kompanije. U stvarnosti, postoje brojni teoretski i praktični razlozi zašto se kompanije ne bave hedžingom. Na teorijskom nivou, možemo polemisati da li menadžeri i akcionari, time što poseduju dobro diversifikovana portfolija, mogu da eliminišu mnoge rizike sa kojima se kompanija suočava. Nije im potrebno da kompanija hedžuje te rizike. Na praktičnom nivou, pokazuje se da za kompaniju hedžing može biti povećanje umesto smanjenje rizika, ukoliko se niko od konkurenata ne odluči za isto.

Kako je Srbija zemlja u tranziciji i postaje sve otvorenija ka međunarodnom tržištu, tako i privredni subjekti u Srbiji ne mogu ostati izolovani na međunarodna dešavanja. To sve zahteva savremenije finansijske instrumente prilikom poslovanja, javlja se sve veća potreba za smanjenjem rizika usled nepredvidivosti tržišta i velikih oscilacija cena. Smanjenje tih vrsta rizika u poslovanju je još uvek nepoznanica za mnoge menadžere kompanija u Srbiji.

Zadnjih godina u Srbiji je napravljen značajan korak u stvaranju mogućnosti zaštite i upravljanja rizikom (pre svega deviznim) jer je Narodna banka Srbije u saradnji sa ostalim relevantnim institucijama uredila zakonsku regulativu i omogućila zaštitu od deviznog rizika (tzv. devizni hedžing). Isto tako, Narodna banka Srbije aktivno radi na promovisanju raspoloživih instrumenata za zaštitu od deviznog rizika, ukazuje na prednosti korišćenja instrumenata zaštite od deviznog rizika koji korisnicima pružaju izvesnost, veći stepen sigurnosti i stabilnosti u poslovanju i

adequate skills and knowledge. By engaging in hedging, however, they are avoiding distressing surprises such as drastic jump in prices of commodities that are purchased and necessary for carrying out current business. In practice, many risks are left exposed without any protection. Further in this paper we shall examine some of the reasons why such a state of affairs would ensue.

Hedging and shareholders

One of the arguments put forward at times is implying that the shareholders, if they should so wish, can themselves engage in hedging (risk protection). It is not necessary for the company to do so in their stead. However, this argument is open for discussion. It is assumed that the shareholders, in the same measure as the managers of the company, are well conversant with all the information regarding risks that the company is faced with. But in most cases, this is not true. This argument also ignores the acquisition (commission) and other transaction costs, which are for a large-scale transaction cheaper than for the smaller one. Logically speaking, hedging will be less costly if it is done by the company, rather then by the individual shareholders. All things considered, the very size of the futures makes the hedging by individual shareholders impossible in many situations.

One of the things that the shareholder can do much easier than the company itself is to diversify the risk. Shareholderwith well diversified portfolio can be immune to many risks that the company is faced with. For example, in addition to holding an equity share in the company using copper, well diversified shareholder may hold shares in the copper production as well, so that his total risk exposure to the price of copper is very small. If the companies are to engage in the best interest of well diversified shareholders, the use of hedging becomes a matter of concern in many situations. However, just to what ultimate end this argument is impacting managers in their practical work remains an open question.

Hedging and competition

If hedging in itself is not a norm in the given industry branch, for companies it is not logical to act differently from their other peers. Competition pressures within the industry may be such that the price of goods in that given area is varied so much that it is reflected on the price of raw materials, interest rates, exchange rate disparities, etc. The company which is not risk protected may expect its profit margin to be relatively constant. However, the company which is risk protected may expect its profit margin to oscillate!

In order to explain this let us examine the case of two manufacturers of gold jewelry, the *Safe and Sure Company*, and the *Take a Chance Company* (Hull, 2009, p. 49). Let us assume that most of the companies in that branch would not be protected from the change in gold prices, and that the *Take a Change Company* is no exception. However, *Safe and Sure Company* decided to become different from its competitors and engaged in the use of futures in order to protect itself over the next 18 months in its purchase of gold. If the price of gold is to rise, economic pressure will strive to bring about the corresponding growth in the wholesale price of jewelry, so that the profit margin of *Take a Chance Company* will remain unchanged. Conversely, the profit margin of the *Safe and Sure Company* will grow when taking into consideration the risk protection effects. If the price of gold is to fall, economic pressure will have the tendency of bringing about the corresponding fall in the wholesale price of jewelry. Again, the profit margin of the *Take a Chance Company* will remain unchanged. However, the profit margin of the *Safe and Sure Company* will plunge. In extreme cases, its profit margin may be negative, as a result of the applied hedging! This situation is explained in Table 2.

This example underlines the importance of assessing the entire picture in case of hedging. In order to create a hedging strategy as a protection from the price change, it is necessary to take into consideration all the implications of the price change on the company profitability.

mogućnost fokusiranja na osnovnu delatnost.

Postojanje i funkcionisanje organizovnog tržišta finansijskih derivativa je ozbiljan i hitan zadatak za sve relevantne faktore u našoj zemlji, tim pre što je vreme spontanog razvoja finansijskih tržišta odavno prošlo. Sada se finansijska tržišta dizajniraju, uz sveprisutno otklanjanje svih prepreka njihovom transparentnom funkcionisanju. Da bi se stvorili uslovi za efikasnu zaštitu od svih rizika kojima su izložene kompanije na domaćem i međunarodnom tržištu, potrebno bi bilo uraditi sledeće:

- Neophodno je unaprediti ponudu finansijskih derivativa, kao što su fjučersi i opcije, kojima se trguje na finansijskom tržištu, ali i raditi na promovisanju već ponuđenih derivativa, kao što su forvardi i svopovi;
- Razmotriti mogućnosti uvođenja izvedenih instrumenata i ugovora na Beogradsku berzu;
- Intenzivirati sve oblike edukacije o zaštiti od tržišnih rizika, kako zaposlenih u u kompanijama i bankama, tako i njihovih klijenata (pravna i fizička lica);
- Uloga Narodne banke Srbije mora da ostane ključna sve dok finansijsko tržište ne profunkcioniše samostalno i dok se ne dostigne njegova likvidnost;
- Potrebno je konačno formirati respektabilnu regionalnu robnu berzu i omogućiti trgovanje proizvođača i zaštitu od rizika putem korišćenja robnih derivativa (forvarda, fjučersa, opcija).

Table 2 Danger from hedging when competition is not hedging

Change of gold price	Effect on price of gold jewelry	Effect on profit of the Take a Chance Co.	Effect on profit of the Sure and Safe Co.
Growth	Growth	No growth	Growth
Fall	Fall	No fall	Fall

Conclusion

Hedging is an investment that serves to reduce or eliminate the risk which pertains to some other investment. Hedging was created to minimize the exposure to the undesirable business risk, but also in order to allow for the profits to be made from such an investment. Hedging is a mechanism - a strategy for lowering possible losses in real business operations of the company. The company must fully be confident of its needs and must have its annual business plan, because the choice of a wrong risk protection instrument may have negative effects instead of the positive ones. The advantage of financial derivatives in respect to the instrument from which they derive is the following: higher flexibility in protection of the position, off-balance sheet records, and payment of price difference, which means that the principal is not being exchanged, and therefore, the risks are lower than those in transactions where the principal is exchanged and which pertain to the instruments from which the financial derivatives have been created. For a proper use of hedging, it is necessary to have a correct strategy, which is based on real monthly/quarterly or annual results of business conducted by that corporate entity.

In this paper we have presented different ways in which a company, by using the position with the futures, can compensate for (even out) its risk exposure to the change in price of the assets. If the exposure is such that the company is gaining when the price of asset is growing, and losing when the price of asset is falling, the short hedge is quite a good solution. If the exposure is reverse (i.e. if the company is gaining when the price of the assets is falling and is losing when the price of the assets is growing) the adequate solution is the long hedge position.

Hedging is the way to mitigate risks. As such, it should have been welcomed with open arms by the company managers. In reality, however, there are many theoretical and practical reasons why the companies are not engaged in hedging. On the theoretical grounds, we may argue whether the managers and shareholders by holding a diversified portfolio, may eliminate many risks that the company is faced with. It is not necessary for them and the company to use hedging from risks. At the practical level, it would appear that hedging may become a greater risk for the company than a reduced one, if none of the competitors is to decide in favor of the same.

Serbia is the country in transition and becoming increasingly open towards the international market, so the economic stakeholders in Serbia can not remain isolated from the international developments. All this requires a more state-of-the-art financial instruments in business operations, and the need which growingly appears for the risk mitigation due to unpredictable market and great price oscillations. Mitigating of this type of risks in business operations still remains an unknown territory for many managers of the companies in Serbia.

During the last few years in Serbia a significant step forward was made in creating the opportunities for risk protection and management (primarily the exchange rate one) as the National Bank of Serbia, in cooperation with the other relevant institutions, has drafted an adequate legal framework and enabled the protection from the foreign exchange risk (the so-called exchange rate hedging). On that same note, National Bank of Serbia is actively engaged in the promotion of the available instruments for protection from the exchange rate risk, indicating at the advantages of using instruments for protection from the exchange rate risk, which is offering its users certainty, a higher degree of security and stability in business, and options for focusing on the core business activity.

The presence and functioning of an organized market of financial derivatives is a serious and urgent task for all the relevant factors in our country, this even more so as

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the time for any spontaneous financial market development is long gone. What now prevails are the financial markets that are designed with an omnipresence of elimination of all the obstacles to their transparent functioning. In order to create conditions for the functioning of an efficient protection from all risks to which the companies are exposed both on the domestic and on the international market, it is necessary to do the following:

- It is necessary to promote the supply of financial derivatives, such as the futures and options traded on the financial market, but also to engage in the promotion of the already offered derivatives such as forwards and swaps;
- Possibilities should be examined for introduction of derived instruments and contracts on the Belgrade Stock Exchange;
- It is necessary to intensify all forms of education on hedging from market risks, both of staff employed in companies and in banks, but also of their clients (both corporate and retail customers);
- The role of the National Bank of Serbia must remain crucial as long as the financial market is not able to function independently, and as long as it does not achieve its proper liquidity level;
- Finally, it is necessary to form a respectable regional Commodities Stock Exchange and allow for trading by producers and protection from risks by using commodity derivatives (forwards, futures, options).