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HEDGING AS A BUSINESS RISK PROTECTION INSTRUMENT

Abstract

This paper deals with hedging which is one of the trading techniques in the futures markets and with the role of hedging as a protecting strategy. Indirectly, hedging affects the competitiveness of a company by reducing overall operating expenses and increasing the level of competitiveness at the same time.

The theoretical fundamentals of the hedging strategy are explained, followed by a survey on relevant theoretical findings and research on hedging and its importance in contemporary economic life. Basic types of risk in firms are clearly described, as well as principal hedging models which are in accordance with the International Financial Reporting Standards.

Finally, the paper deals with the financial aspects of hedging, stressing the role and the importance of the principle of the financial leverage.

Keywords: Hedging, protection, risk, cash flow, efficiency

1. Introduction

Business experience of a large number of Croatian companies reveals the problem of instability and vulnerability with respect to disproportion of foreign exchange rates and volatility of the prices on commodities exchanges. The problem affects almost all of the industries, including tourism, ship building, oil industry as well as confectionary producers – i.e. all of the industries in which the period between contracting, realisation and payment for a specific job is relatively long.

In the context of the growing impact of the mentioned problem and bearing in mind the vital role which futures play in the global economy, there are no formal obstacles preventing Croatian companies from becoming more intensively involved in those markets. The instrument which is specifically being referred to here is hedging. This is a strategy for the prevention of rapid and unpredictable events and price fluctuations on the markets, including prices of oil, steel, freight space, foreign currencies, securities, etc.

The Croatian economy is primarily characterised as weak and open, which makes it extremely exposed to risks in the environment of a globalised economy.

With respect to these characteristics of the Croatian economy and the stated priorities of the economic policies, hedging has been recognised as one of the risk protection tools.

Finally, taking into account a relatively low level of awareness of the trading techniques and strategies on the futures market, which includes hedging, and the confusion with respect to the terminology which seems to exist in the Croatian professional literature, the term hedging itself should also be addressed, since the word *hedging* and the related terms shall be used throughout this paper.

The English word *hedging* is a noun derived from the transitional verb *to hedge*, which means to protect, to fend off. When used as a noun, *hedge* refers to a fence, a means of protection.

When used as a technical term, *hedging* refers to the action by which we protect ourselves against financial loss, i.e. selling or buying futures agreements on the exchange to protect oneself from an unpredictable decline or soaring of prices of certain commodities on global markets, i.e. to reduce the risk and protect oneself against financial loss.

In Croatian professional literature, the word is used in its original English form, as well as in the Croatian-adjusted form of '*hedžing*'. The Croatian version of the word, '*živičarenje*', has been coined but it has not been widely accepted.

However, the words *hedging* and *hedge*, in their original form, should be given preference over the two other possible terms for at least three reasons:

- a lack of an adequate Croatian term, in the grammatical and semantic sense
- if a foreign word is used, it is more acceptable to use the term in its original form, especially if the word is technical. There are numerous technical terms used in different professions which have been directly adopted from a foreign language, mostly English, some of which are used in their original spelling and some have been adapted to the norms of the Croatian language. However, the adaptation of the words has not always been very successful.
- translation of technical terms could lead to confusion and misinterpretations. This is the very reason why medical science still uses Latin terms.

The aim of this paper is to address the advantages and the indispensability of hedging as one of the risk protection methods, and the goal is to raise the awareness of hedging and propose its comprehensive use by Croatian companies.

The main assumption of the paper is that hedging, with all of its limitations, is one of the most reliable ways of protecting cash flow and the financial operations of the company as such, from the losses incurred as a result of the fluctuations in prices on global markets.

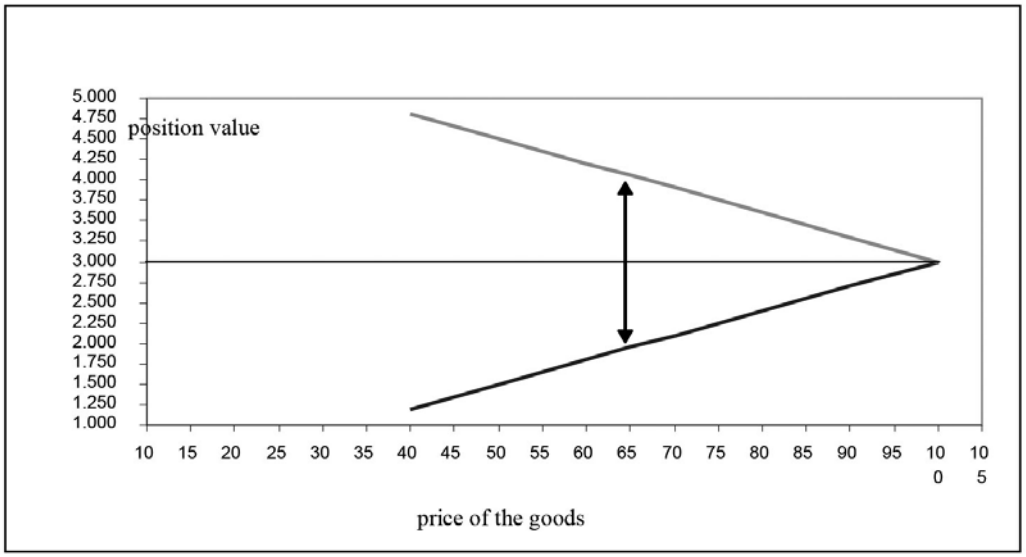
2. *The theoretical background of hedging*

Hedging, as one of the trading strategies on futures markets, is in its fundamental form a procedure aimed at covering, i.e. protecting against risks related to price fluctuations which can very negatively affect the entire financial operation of a company.

To protect against a sudden change in prices – a risk which is always present in any spot position – hedgers simultaneously assume an opposite position on the futures market. That position is of an equal value, but of an opposite position (offsetting). The purpose of hedging is to avoid negative consequence, and not to make a profit (except in the case of speculative hedging), so the final result of hedging amounts to approximately zero. However, the costs of hedging should be counted in, the so-called transaction costs, which include:

- margin costs
- potential margin maintenance costs
- brokerage fee
- opportunity cost of the funds invested in the margin

Figure 1 Simultaneous taking of opposite positions - offset



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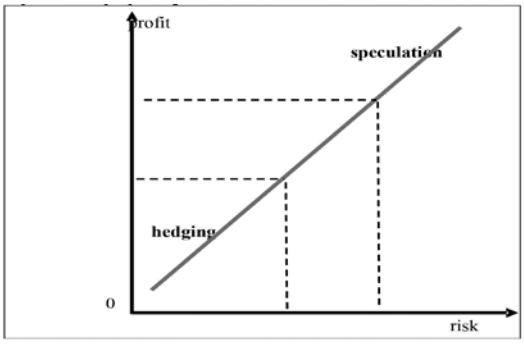
As it is clearly shown in Figure 1, profits and losses in any position on the futures and spot markets will be cancelled out, so that the final result will be neutral, i.e. approximately zero. A successful employment of these instruments can significantly reduce the exposure to typical business risks. However, insufficient understanding of the basic rules of trade or a desire for a quick profit can quickly lead to bankruptcy of any company. One of the best-known examples of a misuse of futures trade is the British Barings Bank, which collapsed in 1995 as a result of uncontrolled futures trading (Dixon, Bhandari, 1997).

This example illustrates that every organisation, depending on its specific activities, must have a detailed and elaborate policy and purpose for trading on the futures market as well as the mechanisms for monitoring the implementation of such a policy.

It is important to stress that hedging, in the original sense of the term, is exclusively aimed at reducing the risk, whereas the possibility of making a profit is only secondary, as opposed to speculation, a strategy based on completely different assumptions, as clearly illustrated in the image above (Figure 2).

Figure 2 Hedging vs. speculation



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3. Types of risk in companies

Companies doing business abroad, which is the majority of modern businesses, are exposed to different types of risks. In addition to the political risk, the risks generally concern the foreign exchange rate fluctuation and the fluctuation of the prices of commodities and services.

This can generally be described as the difference between the spot and futures prices, i.e. the current market prices and the prices at a specific future date.

Taking into account all of the above, three specific types of risk exposure may be identified (Van Horne, 1993)

a. Translation exposure

b. Transaction exposure

c. Economic exposure.

Translation exposure refers to the change in accounting income and balance sheet statements caused by changes in exchange rates.

Transaction exposure relates to settling particular transactions, while economic risk exposure involves (negative) changes in expected and planned future cash flows of a company, and hence its economic value, which is probably the most important risk of all of the above.

There are multiple ways and paths for managing risk exposure to a larger or a smaller degree: regular insurance, swaps, diversification of business activities and the investment portfolio, futures contracts and forward contracts.

3.1 Hedge accounting under IFRS (International Financial Reporting Standards)

International Financial Reporting Standards (IFRS) (Available at: www.iasplus.com/en/standards/ifrs) generally treat the hedge accounting methods in connection with options operations and other different derivatives. Since the options trade is still at its early phase in Croatia, as well as hedging and other futures markets trading strategies, only the basic principles laid down in the IFRS shall be presented here: In hedge accounting, all types of derivatives must be recorded according to their fair value. There are three types of hedging relationships:

1. fair value hedges
2. cash flow hedges
3. hedges of net investments in foreign operations.

Hedge effectiveness method should also be added to the above list.

3.2 Fair value hedges

Generally, fair value, as defined and used in the theory and practice of finances, is a method for the assessment of the value of something that does not have a defined and widely-known market price, in accordance with the standard methods acceptable to both parties included in the sales and purchase transaction.

In mathematical terms, this definition can be expressed as follows:

$$\textbf{Fair Value (FV)} = \textbf{f}(\partial; \textbf{ROI}; \textbf{t}) \quad (1)$$

Where: - ∂ = risk factor
- ROI = return on investment
- t = time

3.3 Company's cash flow hedges

Company's cash flow hedges are one of the most common business goals of hedging in practice. These hedges are used in two basic hedging methods.

3.3.1 Cash flow hedges

Cash flow hedges protect against the exposure to fluctuations which:

- can be ascribed to a certain risk related to an instrument or obligation, or to a highly likely external factor which is difficult to predict;
- could affect the published Profit and Loss Statement.

The part of the profit or the loss related to the hedge which was designated as the hedging instrument (e.g. derivative) is recognised as a reserve component of the equity. Any ineffective part of the fluctuation of the hedge instrument's fair value is immediately registered in the P&L.

The ineffective part includes the specific components excluded (as specified in the risk management strategy) from the hedge effectiveness testing (e.g. time value of options). Other common sources of cash flow hedge ineffectiveness include: structured

features of a derivative built into the hedging instrument, changes in the designated time for the highly likely transaction, and differences in underlying of the hedged item and the hedging instrument. In the case of ineffectiveness, the profit and loss amount of the hedging instrument that can be accumulated in the hedge reserve is limited either to the lower of the cumulative change of the cumulative gain or loss on the hedging instrument or the cumulative change in fair value of the hedged item.

The part of the profit or loss on the hedging instrument (e.g. derivative) which has been designated as an effective hedge is directly recognised in the separate equity reserve. Any ineffective part of the fluctuation of the hedge instrument's fair value is immediately registered in the P&L.

3.3.2 Hedge of net investments in foreign operations

Net investment hedge or the hedges of net investments in foreign operations are a protection against the foreign currency risk exposure due to the entity's interest in net funds in a foreign operation. Hedging instrument can either be a derivative or non-derivative (a loan expressed in the same currency as the net investment). The figure below shows the accounting treatment of the hedges of net investments in foreign operations.

The effective part of the profit or loss on the hedging instrument is recognised in the equity. Since the future foreign exchange differences occurring in relation to the net investment are also recognised in the equity, it is important to ensure that the foreign exchange differences are matching. Profit or loss in connection with the ineffective part of the hedge is immediately recognized in the P&L.

4. Hedging and financial leverage

Leverage refers to the use of a loan, i.e. borrowed funds in financing business operations of an entity. The leverage rule basically states that the borrowing is justified if the resulting generated income exceeds the cost of borrowing.

The financial leverage principle is simply demonstrated in the equation below (Jurković, 1984):

$$F = rV + (r - k)T \tag{2}$$

Where:

F = financial result of a business transaction (profit);

V = own funds share;

T = borrowed funds share;

r = gross return rate;

k = cost of borrowing.

If both sides of the equation are divided by V, the result is:

$$\frac{F}{V} = rv + \frac{T}{V(r-k)} \tag{3}$$

In the above equation, rv refers to the return on own funds (equity), i.e. the net return rate.

Providing that the other parameters are fixed, the return on equity increases proportionally with the increase of the leverage, i.e. an increased degree of borrowing.

This is also shown in the table below (Table 1; Figure 3).

The application of the financial leverage is used daily as a result of the margin system employed on the futures markets. The system is simply illustrated in the following example[1].

Let us assume that, on 1 March, an investor purchased (entered a short position) 100 July oat futures contracts at the price of $1.71 per bushel on a futures market. Further, let us assume that on the next day, 2 March, the price decreased to $1.68 per bushel, leading to a loss of 3c per bushel. Since each contract was for 5,000 bushels, the total value of the purchased contracts was 500,000 bushels, i.e. the nominal investment was $855,000. In accordance with the futures market rules, the investor was obliged to pay 5% on top of the initial margin (depending on the daily fluctuations in oat prices on the commodities exchange) for the amount, i.e. $42,750.

Table 1 Portions of borrowed (T), own funds (V) and return (rv)

T/V	T %	V %	rv %
/	100	0	/
19.00	95.00	5.00	46.00
9.00	90.00	10.00	26.00
5.67	85.00	15.00	19.33
4.00	80.00	20.00	16.00
3.00	75.00	25.00	14.00
2.33	70.00	30.00	12.67
1.86	65.00	35.00	11.71
1.50	60.00	40.00	11.00
1.22	55.00	45.00	10.44
1.00	50.00	50.00	10.00
0.82	45.00	55.00	9.64
0.67	40.00	60.00	9.34
0.54	35.00	65.00	9.08
0.43	30.00	70.00	8.86
0.33	25.00	75.00	8.66
0.25	20.00	80.00	8.50
0.18	15.00	85.00	8.36
0.11	10.00	90.00	8.22
0.05	5.00	95.00	8.20
0.00	0.00	100.00	8.00

Source: Author

After the exchange was closed, the loss of $15,000 will be deducted from the deposited margin and the investor will receive a margin call – a call from a broker to pay another $4,313 to reach the allowed maintenance margin, which generally amounts to 75% of the initial margin and which is $32,036 in the given example.

The margin – the deposited funds used to cover the corrections of the daily fluctuations of the contract's value – remains in the possession of the investor, who is, with the 5% of the total investment value (contract value), in absolute control of the entire value of the contract, from the moment of the purchase to the realisation of the contract.

The price of oat grew continuously from that date onwards. Let us assume that, after three months of the market price growth, the investor liquidated the contracts (entered a short position) at the price of $1.82 per bushel on the futures market and simultaneously purchased an adequate amount of oat on the spot market.

If we exclude the hedging effects in this example, the financial transaction can be shown as presented in the following table (Table 2).

We can now apply the abovementioned equation for the calculation of the return on own funds (no 3). In this case k=0, since no funds have been borrowed (opportunity cost is not counted in). The gross ROI for the transaction is r=4.428%. This means that the return on own funds (rv) is calculated as follows:

r = 4.428%

T/V = 48.88

k = 0

rv = 220.92%

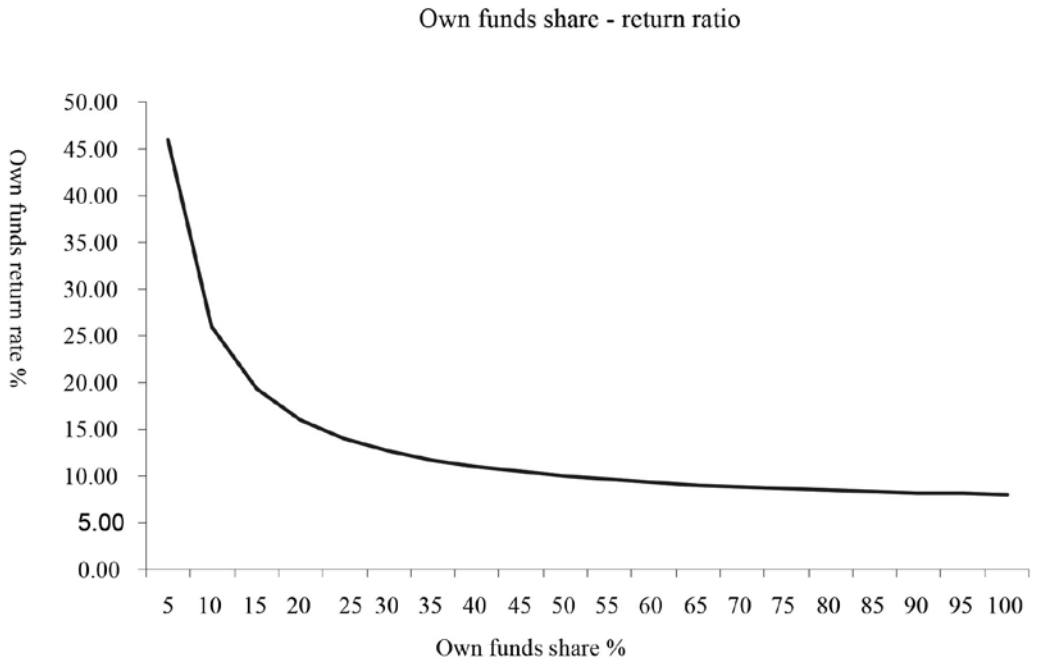
Since the ratio between own and borrowed funds is approximately 2%:98%, where the borrowed funds do not exist – they are only fictional, the return on own funds must be this high, as indicated in Figure 3.

Hedging strategy does not only serve the primary purpose of risk exposure protection, but, as a result of the margin system, it can also be used to control and manage very large amounts with relatively small investment and transaction costs, as illustrated in the above example.[2]

5. *Whether to hedge or not?*

An overview of the relevant literature on the topic of hedging, futures trade and other related topics reveals that the number of papers published abroad, especially in the English-speaking countries, is immeasurably larger than of those published on Croatia. This does not come as a surprise, considering the fact that Croatian economics experts only recently became familiar with the futures markets, hedging, risk exposure protection, etc., and the business sector is only slowly and very cautiously entering these domains.

Figure 3 Own funds share - return ratio



Source: Author

Table 2 Overview of financial transactions on the futures market

No.	Activity	Amount ($)
1.	Entering a long position	855,000
2.	Initial margin payment	42,750
3.	Maintenance margin cost	32,063
4.	Margin call	4,313
5.	Total commission	12,825
6.	Entering a short position	910,000
7.	Transaction result (on the futures market)	55,000
8.	Difference - investment (invested own funds)	17,138
9.	Maintenance margin repayment	32,063
10.	Final result of transactions (on the futures market)	37,862

Source: Author

The first major foreign literature books appeared in the early 1970s, and a proliferation of the publications in this field occurred in the early 1990s. It is interesting to note that the investor's "Bible", the famous book by B. Graham "The Intelligent Investor", first published in the late 1940s, almost completely neglects hedging as a risk exposure protection mechanism and a very important phenomenon in investing and business. Graham's advice on risk reduction is conservative. The author suggests that the risk can be managed by the decision on how much the entity will invest in shares, diversification and re-balancing. (Graham, 2006) The more recent books addressing the topics of portfolio strategies, hedging, securities, risk reduction, etc. express a relatively sceptical view of derivatives, since they were written when derivatives and financial markets were in their early phases, whereas the most recent publications advocate a much more positive approach to these instruments.

A major development and expansion of futures markets in the 1980s, and the 1990s in particular, led to a boom in publications relying exclusively on mathematical equations and relations to forecast the future of business and reduce the risk to an acceptable minimum level (R. Stultz, C. Smith, J. Cvitanić, J. Kearney, etc.).

Such an approach is understandable, since this was the period of the "golden age" of the application of mathematics on market and business analysis. At that time it was popular for the financial and brokerage firms (Merill Lynch, A. Andersson, Goldman & Sachs) to hire mathematicians and astrophysicist (sic!) to analyse financial markets. This naturally led to the generation of numerous mathematical forecasting and determination models, which were considered highly reliable and, yet, which proved to be more or less unsuccessful. The statement which J. K. Galbraith made while referring to Irving Fisher in the book "The Age of Uncertainty" seems to have been justified. He wrote that "the mathematical economics has so far not enabled us to fully grasp economics, but we have to credit it with one thing: it does provide numerous economists with an opportunity to do something." (Galbraith, 1982) This, somewhat sarcastic remark, can be supported by the fact that some of the most famous losers in the exchange business were I. Fisher and many years before that Sir Isaac Newton.

In the paper „Hedging in the Theory of Corporate Finance: A Reply to our Critics", published in 1995, Merton Miller and his colleague Christopher Culp from the University of Chicago (Journal of Applied Corporate Finance, 1995) suggested that the majority of companies which maximise their value do not use hedging. This statement was supported by the example of the company Metallgesellschaft, whose value decreased after an oil price hedging collapse[3], as an immediate result of a poorly chosen hedging strategy.

A study conducted by Chase Manhattan Bank and Wharton School in 1995 (The Economist, 1996) reiterated the thesis that the majority of companies that use derivatives do so in order to hedge.

The study showed that 75% of the companies which used derivatives (about 1/3 of the sample) did so to hedge their cash flow, 40% of the subjects occasionally used derivatives to assess the trends on a particular market, and only 8% of the subjects used that strategy often.

To justify derivatives speculation, managers must have solid grounds on which they base the assumption that they can outsmart the companies whose main activity is derivative trade. The companies trading with commodities, such as oil, cereal, etc., and which hedge in order to protect their cash flow definitely have a strong reason to hedge and they might even make some profit in that way. However, non-financial companies that "bet" on interest rate or exchange rate, even though they might occasionally make some profit, usually do not make any significant income in that way.

The question crops up: Why is hedging sometimes the wrong choice?

In the famous M&M theorem from 1950, the future Nobel Prize laureates M. Miller and F. Modigliani demonstrated that a company can only make money if it makes profitable and high-quality investments which constantly increase the company's cash-flow. The methods and the sources of such financing are irrelevant, according to the authors. Whether the business is financed by shares, bonds, bank loan or in any other way is relevant only in the context of the subsequent profit distribution. If this is correct, it can have major ramifications on hedging. If the financing methods and the type of financing risk are of minor importance, why do we even address them? The employment of derivatives to hedge is then useless since it does not increase the company's value (!), just the opposite: since derivatives (and hedging) involve a cost, they increase

the liabilities and thus decrease the overall value of the company. Consequently, companies should not worry about the financial risks; they should leave that to investors, who should diversify the investment portfolio.

Naturally, these arguments faced a large number of opponents, who partially or fully rejected Modigliani-Miller attitudes and theses. The majority of them challenged the thesis on the questionable role of hedging and its potentially harming effect on the company's value arguing that hedging can even increase the value. The main reasons for that are growing volatility of global markets and the dispersion of risks, forcing the companies to take a part of the responsibility for the management of the risk, thus preventing potential financial problems or even bankruptcy.

Such attitudes have gained popularity among economists and financial experts from the area of micro economics (Corporate Finance). This is largely due to the paper by three Boston economists, Kenneth Froot, David Scharfstein and Jeremy Stein, entitled: "A Framework for Risk Management", published in 1994 in the *Harvard Business Review*.

This paper showed, without rejecting the M&M theorem, that companies need to hedge in order to protect their cash flows and ensure liquidity and solvency, thus making timely financing of potential investments possible at times when external borrowing (regardless of the kind) is significantly hindered. This paper gains more weight at times of financial crisis of global proportions, such as the current one.

On the example of the American pharmaceutical company Merck (Lewent, Kearny, 1993) it was demonstrated how a combination of derivatives and hedging can be used to reduce operational costs and safe and regular business financing and thus increase the value and competitiveness of the company on the global market. The authors conclude this landmark work with this statement: "...it is our conclusion that, in the pharmaceutical and other industries, the instability and uncertainty of cash flows and profit caused by the currency exchange rate volatility results in reduced investment in research." The ramifications of this effect (of a slowed-down development) on individual companies, and consequently on entire economies, are self-evident.

The three authors from Boston – Froot, Scharfstein and Stein – in the above-mentioned work, warn that any disturbance in regular cash flows leads to development deceleration or downturn, placing any company in an unfavourable position on the market. For example, a decrease in oil prices causes disturbances in cash flows and profit and loss accounts of some oil companies, which results in significant cuts in the investments in research and development, which in turn are necessary to locate new oil reserves. In this way, the competitiveness of the company and its value are significantly reduced. The authors see cash-flow hedging as an adequate method for escaping, or rather preventing such a situation.

Rene Stulz, a professor of finances at the Ohio State University proposes two strong arguments in favour of hedging (Stultz, 1995):

- securing the cash flow of a company, enabling stable operations and development
- reducing the taxable income in case of the companies whose profit regularly varies between tax brackets.

Professor Stulz further elaborates these arguments in his paper (Stultz, Smith, 1985), claiming that highly geared companies have more reasons to hedge, since they are more exposed to financial risks and since hedging can be used to remove the excess risk and thus increase the firm value.

This statement is, according to the author, supported by the fact that, during the leveraged buyout boom in the 1980s, which involved a company buyout at the expense of borrowing, a simultaneous boom in the employment of hedging and in the firm value took place. However, this was the case on the Anglo-Saxon markets, whereas the "Croatian buyout" occurred about fifteen years later, involving completely different methods and having completely opposite consequences.

However, not all of the experts are unanimous in the assumption that the need for hedging increases with the level of a company's indebtedness, and vice versa. Myron Scholes, who became widely known for his option pricing model, which he developed in tandem with Fischer Black, on the basis of the research which he carried out at Stanford, considers that even the companies with a relatively low indebtedness level should use hedging to reduce risk and create more opportunities for trading on the capital markets, since the use of own financial sources often comes at a higher price than the use of

external sources. Of course, a higher external debt makes the company more vulnerable to risk and, as stated above, more prone to use hedging to protect its cash flows.

The main cause of the higher price of own financial sources refers to the fact that the investors (owners) seek out higher return rates than those granted on securities or on bank loans. Besides, Myron Black, as a true representative of the Chicago School, claims that many companies will, as a result of the risk-reducing hedging and the related borrowing, remain or become predominantly privately owned.

The mentioned famous pricing option model, known as the "Black & Scholes Formula" was first presented in the paper "The Pricing of Options and Corporate Liabilities" (Black, Scholes, 1973), back in 1973, while they were still lecturing at the University of Chicago, MIT.

The model of pricing European put and call options is the following:

$$C_t = \underbrace{S_t \cdot N(d)}_{\substack{\text{recommendad} \\ \text{hedging} \\ \text{strategy}}} - e^{-r(T-t)} K \cdot N(d - \partial\sqrt{T-t}) \quad (4)$$

Where:

N(d) – number of securities (>0)

S_t - value of securities

The interesting fact is that the first segment in the equation indicates the portion of securities to be purchased, i.e. suggests the adequate hedging strategy for each investor, in addition to determining the price of the options. The main rationale behind this model is the assumption that there is only one risky amount and one source (cause) of instability or uncertainty, and this allows for the compilation of a portfolio that matches the ROI of the options, and the price of such a portfolio should be equivalent to the price of the option.

In the book "Introduction to the Economics and Mathematics for Financial Markets" (Cvitanić, Zapatero, 2004) J. Cvitanić and F. Zapatero of the California Institute of Technology discuss the Optimal Hedging Ratio, (Cvitanić, 2009) the regression model for hedging effectiveness assessment and the Black and Scholes model in an elaborated, yet highly mathematical, way.

Optimal Hedging Ratio (ρ) defines the relation between three parameters:

$$\text{Optimal Hedge Ratio} = \rho \cdot \left(\frac{\partial S}{\partial F}\right) \quad (5)$$

a) standard deviation, i.e. volatility of market prices during the hedging period (∂S)

b) standard deviation, i.e. volatility of derivative prices for the same group of commodities (∂F)

c) correlation coefficient between market prices and prices of derivatives (ρ)

The above equation clearly shows that the proportion, i.e. the size of the optimum share to be hedged, grows proportionally with an increase in the correlation between the spot price and the price of derivatives, i.e. future spot prices and the ratio between their standard deviations.

The correlation between hedging in companies and the competitiveness of individual national economies has not been examined yet in a scientific way, since a logical interdependence between the increase/decrease in the competitiveness of a company and an increase/decrease in the competitiveness of the economy is assumed.

Hedging, as a protection strategy, generally speaking, protects a company from excessive business risk, thus reducing business costs and making the company more economical and more competitive.

As for the connection between hedging and firm competitiveness, we would like to refer to a paper by two American scientist – Christine Parlour (University of California) and Tingjun Liu (Arizona State University) – entitled: "Hedging and Competition" (Parlour, Liu, 2008). In the paper, the authors examine the possibilities for direct hedging of cash flow, assuming the purpose of business risk reduction, but simultaneously involving an increase in the risk exposure on financial markets due to the use of hedging (options of different types and categories).

This constitutes another argument in favour the thesis that companies should hedge using the instruments as closely underlying the core business as possible.

The other landmark paper in this field dates back to 2006 and it was written by three American scientists: Tim Adam of the Humboldt University, Sudibto Dasgubta of the University of Hong Kong and

Sheridan Titman of the University of Texas. In their paper "Financial Constraints, Competition and Hedging in Industry", (Adam, Dasgubta, Titman, 2006) they come to an interesting conclusion that there is no and there can be any homogenous and generally applicable model and principle of hedging. The authors observed that each firm creates a hedging strategy depending on the business results, market share, size, type of activity, the situation on the market, etc.

As in the case of the Optimal Hedge Ratio, which is to be determined by each firm individually and which depends on a number of specific and changeable parameters, hedge effectiveness testing (measuring) is also specific to each firm and it depends on the conditions in which the given firm operates.

The most general and wide-spread hedging effectiveness testing method is regression analysis and its variations (linear, exponential, etc.).

The regression technique for hedge effectiveness testing was probably presented in the most elaborated way in the book "Finance for Strategic Decision-Making" (Narayanan, Nanda, 2007) by M. P. Narayanan and V. K. Nanda of the University of Michigan (Croatian translation). The authors emphasise and explain the role of determination coefficient (R^2) in regression analysis of hedge effectiveness. They argue that the coefficient of determination is the best indicator or the protection measure. The coefficient of determination indicates the cash flow deviations which can be ascribed to the volatility of an independent variable. In other words, the higher the determination coefficient, the better is the hedge effectiveness.

An excellent paper on the topic, entitled "Hedge Effectiveness Testing", was published in "Risk Management". The authors of the paper are Ira Kawaller and R.B. Steinberg. (Kawaller, Steinberg 2002) The authors analyse the advantages and disadvantages of regression analysis as a hedge effectiveness testing method, and also claim that the coefficient of determination is the most reliable measure of hedge effectiveness. Likewise, they warn about the need for an individual approach in hedging. The authors also address the dollar offset method, as the simplest method for hedge effectiveness testing and measuring. The method involves a comparison between the changes in derivatives value and the changes in the variations of the dependant variable, i.e. the hedged item. In practice, the term "highly effected" refers to the effectiveness of 80% to 120%. The major disadvantage of this method is that the set effectiveness criteria are difficult to meet, and the advantage refers to the simplicity of application.

In addition to the mentioned authors, we would also like to mention J. Cvitanić, John C. Hull, and F. J. Fabozzi, who prefer regression analysis, more precisely, the linear regression analysis, for hedge effectiveness testing. The approach by Ronald Ripple of Macquarie University and Imad Moosa of La Trobe University, presented in the paper "Futures Maturity and Hedging Effectiveness - The Case of Oil Futures" (Ripple, Moosa, 2005) is particularly interesting. The paper examines the relations between derivatives delivery date (in this case: futures) used in hedging to protect the company against the risk of an increase/decrease in raw oil prices on the spot market. By comparing the daily and monthly spot and futures market fluctuations, i.e. by measuring their volatility, the authors determined the Optimal Hedge Ratio and came to conclusion that the lower the volatility, the higher is hedging effectiveness; and the volatility is lower when futures with shorter delivery dates are used. In other words: the lower the risk, the more effective is the hedge.

By employing regression analysis in the assessment of the quality of the hedge effect on the protection of cash flows, an indicator of hedging necessity or |Z| indicator[4] has been defined, which is presented in mathematical terms as follows:

$$Z = R^2 \times \beta \tag{6}$$

Where:

- R^2 = coefficient of determination

- β = coefficient of elasticity ($E_{y,x} = \beta$)

This paper would be incomplete if we failed to mention some of the Croatian authors who have been active in the area of futures trade and hedging, as one of the important futures market strategies. The most prominent authors in the field are M. Hanžeković, H. Šimović, S. Orsag, Z. Prohaska and T. Lazibat. The Croatian authors have generally published papers whose goal is to offer an overview of futures trade, the related strategies and their advantages and pitfalls, and present them to the wider public.

6. Conclusion

In today's world, both in the political and the economic arena, the level of uncertainty is extremely high. Numerous political, social and other factors affect the prices of various instruments and commodities on the global markets. Hedging is one of the effective and widely used instruments for the protection against such price fluctuations. Hedging has been developed by contemporary brokers and managers as a reaction to a major risk of potential losses. Global trade, liberalisation of almost all world economies and the ever wider trade opportunities at futures markets all gave rise to hedging.

Therefore, the basic role of hedging as a futures market trading technique is to protect against business risk, i.e. a rapid and significant increase/decrease in the prices of commodities or services on the international market.

Generally speaking, risk refers to a possibility and a certain degree of likelihood for the occurrence of an event with adverse effects. Risk is increasingly becoming an integral part of the operation of a company in its technological, commercial, financial and general, business aspect. The degree of risk is quantifiable. The purpose of the risk is therefore to measure and plan. Risk and business performance are therefore negatively correlated.

The fact that business in the highly globalised world is highly risky is indisputable. This trend is expected to continue in the future. It is for that reason that export industries are at an advantage due to their elasticity with respect to internal and external factors.

Therefore, the initial hypothesis stated in the introduction on the usefulness of hedging as a business risk protection method has been confirmed.

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(Endnotes)

1 The example adopted and adjusted from: Lazibat T.,et.al.(2007), Burzovno poslovanje – terminska trgovina, Zagreb: Znanstvena knjiga, pp. 11-12.

2 It should be noted that the financial leverage principle also applies in the case of a negative transaction result, which can potentially have adverse effects.

3 In the early 1990s, the German giant Metallgesellschaft (MG) sold a large amount of fixed long-term oil contracts. The oil prices on spot markets dramatically dropped in the meanwhile and MG had to cover huge amounts due to margin calls on futures markets, losing approximately $1.4 bn and leading the company into serious financial problems.

4 For more details see: Šperanda I. (2013), „The Importance of Sustaining and Improving Company's Business Success Using Indicator of Hedging Necessity", Montenegrin Journal of Economics, Vol. 9, No. 4, pp. 21-39.

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Hedging kao instrument zaštite od rizika u poslovanju

Sažetak

Rad raspravlja o *hedgingu*, kao jednoj od metoda trgovanja na terminskim tržištima, i ulozi hedginga kao zaštitne strategije u poslovnom životu poduzeća koja posredno, snižavajući troškove poslovanja i smanjujući poslovne rizike, utječe i na sveukupno poslovanje i povećavaju stupanj konkurentnosti poduzeća.

U radu se objašnjava teorijska utemeljenost *hedginga*, te pregled relevantnih promišljanja i istraživanja o *hedgingu* i njegovom značenju te ulozi u suvremenoj svjetskoj poslovnoj praksi. Pregledno su izloženi osnovni tipovi rizika u poduzećima. Opisani su osnovni modeli hedgiranja sukladni Međunarodnim standardima financijskoga izvješćivanja.

U radu se raspravlja i o financijskim gledištima uporabe *hedginga* pri čemu se posebno naglašavaju prednosti sustava trgovanja putem margina i djelovanje financijske poluge.

Ključne riječi: *hedging*, zaštita, rizik, gotovinski tijek, učinkovitost