IMPACT OF BASIS RISK ON THE ORGANIZATION
OF HEDGING TRANSACTIONS WITH FUTURES CONTRACTS

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Abstract: Speaking about hedging transactions it should be stated that they are hard to organize in practice. The level of gain and loss in hedging transactions is determined by the existing ratio of cash prices and futures prices at the moment of hedging placement and at the moment of hedging maturity. At the futures markets one should continually perform transactions in order to secure the future position at the prompt market. When defining their strategies, the greatest risk the hedgers are faced with is the basis risk. The difference between the cash prices and futures prices is dubbed basis risk. The aim of this paper is to show in what cases the impact of basis risk on the organization of hedging transactions with futures is intensified and to establish the key factor which impacts the basis risk on the example of hedging transactions with futures.

Key words: hedgers, hedging transactions, basis risk, cash prices, futures prices.

1. Introduction

Hedgers protect themselves from risk by organizing hedging transactions which simultaneously affect the speculators, thus reducing their interest in active participation at the stock exchange. Their use benefits the protection against price risk arising from forward contracts. Thus, the price risk is minimized with the elimination of making major returns resulting from the securities' prices increase. Therefore, a continuous entry into transactions is a characteristic feature for hedgers, since it ensures their future position at the spot market. At the futures market, hedgers have no objections to the current price of the contract because they are neither familiar with the date for the delivery of assets nor with the maturity date of the futures contract, when acting as a buyer. However, the protection in

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practice should have been made from a spot position in a month with no due contracts of respective assets.

Therefore, it is noted that hedging transactions are difficult to organize in practice. The amount of gain or loss in hedging transactions is determined by the ratio of cash prices and futures prices at the time of hedge placement and maturity of the hedge. That very difference in prices (between cash prices and futures prices) is called basis risk, which is the biggest risk a hedger faces in defining its hedging strategy.

2. Basis Risk

Risk impact onto organization of a hedging transaction with futures contracts is directly reflected onto development of such transaction. With respect to the above, it should be noted that a hedging transaction takes place in several stages. "In the first stage it is necessary to determine the precise level of exposure to a particular risk. The second stage foresees the change of critical factors. Then, the hedging instrument that is reliable for minimizing risk is determined the third stage, while market transactions that provide protection against the risks are combined in the fourth stage." (Radović, R., Panić, P., Starčević, V., 2000, p. 217-218).

It is necessary to implement the above because it is difficult to find a transaction in practice that would perfectly respond to the position that is being protected from risk. The extent to which risk would be eliminated primarily depends on the similarity of the instruments combined.

However, due to hedgers' urge to continuously enter into transactions in order to ensure their future position at the spot market it is essential for them to define their own hedging strategy. In defining hedging strategies, the greatest risk hedgers regularly face is the basis risk. Basis risk is the difference between cash prices and futures prices. The basis is represented as follows:

Basis risk = cash price – futures price

The basis risk may be equal to zero (or near zero); it may rise or drop. "Basis risk will be equal to zero (or near zero) if the futures contract maturity due date is approaching." (Vunjak, N., Kovačević, Lj., 2009., p. 340). Basis risk increase will result in faster growth of asset prices than the prices of futures contracts, and will cause its decline if the prices of futures contracts are increased faster than the assets price. Hedger will be able to influence the basis risk only in case of a correct selection of futures contracts that would be used for hedging.

To avoid possible basis risk that may be caused by the decline of the futures contracts prices, hedger required the right selection of hedging strategy

3. Hedging Strategies

From the perspective of the hedgers at futures markets, current contract prices are mainly favourable - the main reason being the lack of an exact date of delivery of the given assets. In such case, where the hedger is unfamiliar of the date of the assets delivery, the

hedger might be struck by price changes in assets and futures contracts that do not need to be synchronized. Such event would jeopardize the hedgers' income generation and the essence of their trading. The essence of hedgers' trading is the protection against the risk of possible price changes that would jeopardize their profit.

Unsynchronized changes in asset prices and futures contracts would cause an increase or a decrease of the basis risk. If the asset prices would increase faster than the futures contracts' prices, it would expose the hedger to the growth of the basis risk. Therefore, in defining its own hedging strategy, a hedger should pay particular attention to the basis risk he is about to face. Defining a hedging strategy is crucial for a hedger, since it is based on the fact of low risk and compensating for the loss through trade profit. Hedger's selection of hedging strategy depends on the hedger's current position in relation to the possession of securities or commodities. If a hedger owns certain securities or commodities, then he finds himself in a *long position*. Protection against the possible basis risk caused by the drop in the price of the futures contracts would redirect the hedger to take a *short position*. However, if the hedger does not possess any securities nor commodities, he finds himself in a *short position* aiming to take a *long position*.

Hedger activities at entering and exiting the futures exchange market are presented in the following table:

Table 1: Hedger positions at a futures stock-market

HEDGER			HEDGER	
No.	Hedger entry into futures exchange market	action	Hedger exit from futures exchange market	action
1.	Long position open	Finalises purchase contract	Short position open	Finalises sales contract
2.	Short position open	Finalises sales contract	Long position open	Finalises purchase contract

Source: (Komazec, S., Kovačević, R., Erić, D., Ristić, Ž., 1998., p. 576)

Due to the basis risk impact onto the organization of hedging transactions with futures contracts at the futures market, and for the hedger to guard against it, the best option would be if the hedger entering the futures market opened a long (purchasing) position and short (selling) position, and in the process of exiting the futures stock exchange opened a short (selling) position and long (buying) position, as can be seen from the above table. In order to illustrate hedging, the paper will use a specific example of organizing hedging transactions with futures contracts.

4. Example of Hedging Transactions with Futures Contracts

It was noted that changes in asset prices and futures contracts at the futures market do not need to be synchronized. In case the price of assets (securities or commodities) are growing faster than the price of futures contracts, it amplifies the intensity of the basis risk impact onto organizing hedging transactions with futures, since the risk is then increased.

However, in order to influence the growth of the basis risk, it is essential to correctly preselect the key factors i.e. to establish a hedging strategy, a position and a futures contract which should be used for hedging by the hedger.

In order to confirm the above observations we would use the following example: (Example according to: Fabozzi, JF, Cole, S., 1985, p. 354-357).

Suppose that an agricultural company *PD "Semberija", Novo Selo, Bijeljina* expects to sell 20,000 bushels of wheat at futures market for six months from now, and that the flour mill *AD "Žitopromet" Bijeljina* wants to buy 20,000 bushels of wheat at futures market six months from now. Both companies - agricultural company producing wheat and a milling company producing flour wish to protect themselves from negative fluctuations of wheat prices, i.e. wish to eliminate wheat price risk for six months from today. Current cash price of wheat is about 2.65 $ per bushel and the current futures price is $ 3.30 per bushel. Each futures contract contains 4,000 bushels of wheat.

Wheat manufacturer seeks protection against the wheat price drop six months from now and it will set the short (selling) hedge. Wheat manufacturer will sell 5 futures contracts (because each futures contract contains 4,000 bushels of wheat) and take over the responsibility to deliver 20,000 bushels of wheat six months from now at the current futures price of $ 3.30 per bushel.

Flour manufacturer seeks protection against the wheat price increase six months from now and it will set the long (purchase) hedge, buying 5 futures contracts or 20,000 bushels of wheat, six months from now at the current futures price of $ 3.30 per bushel.

It is assumed that, at the time of placing the hedge, cash price is $2.10 and the futures price equals to $2.75 per bushel. It is also noticeable that both cash and futures price dropped, but the basis remained unchanged and at the time of placing the hedge it amounts to -$0.65 ($2.65 - $3.30 = -$0.65 and $2.10 - $2.75 = - $0.65). At the time of hedge placement, the wheat manufacturer wanted to have a fixed price of $2.65 per bushel or $53,000 for 20,000 bushels. This would mean that it has sold 5 futures contracts at a price of $3.30 per bushel or $66,000 for 20,000 bushels. By placing the hedge in six months, the value of its wheat equals to $42,000 (2.10 x $20,000 bushels). Wheat manufacturer accomplishes wheat price drop at the cash market of $11,000 ($42,000 - $53,000 = -$11,000) which, in fact, represents its loss. Likewise, futures price also dropped to $2.75 per bushel or $55,000 (2.75 x $20,000 bushels) for 20,000 bushels. In this case, the wheat manufacturer accomplished gain at the futures market in the amount of $11,000 ($66,000 - $55,000 = -$11,000). This means that the wheat manufacturer has experienced neither a gain nor a loss, since the gain at the futures market equals to a loss at the cash market, while keeping the short (selling) hedge - perfect.

Flour manufacturer would experience gain at the cash market in the amount of $11,000 ($53,000 - $42,000 = $11,000) due to drop in cash prices, but would simultaneously suffer loss at the futures market in the amount of $11,000 ($55,000 - $66,000 = - $11,000), which would mean that the long (purchase) hedge was also perfect.

Two important conclusions can be made based on the above. First, the participants experienced neither profit nor a loss, the main reason for such event being the basis that remained unchanged at the time the hedge was placed. Therefore if the basis (basis risk) remains unchanged, a perfect hedge is achieved. Secondly, it is clear that the flour

manufacturer would benefit if it had not used the hedge. The price of wheat at the cash market would be reduced by $11,000. However, such action cannot be regarded as a failure in making decisions, since managers usually do not deal with speculations on the price of wheat, and hedging is a standard method of protection against the increase in the cost of operating business in the future.

In the next example it is assumed that at the time of hedge placement, the cash price of wheat increased to $3.65, while the futures price rose to $4.30. Thus, the basis has not changed and it still remains at - $0.65 ($3.65 - $ 4.30 = - $0.65).

In this particular case, the wheat manufacturer should experience profit, because the value of 20,000 bushels of wheat amounts to $73,000 ($3.65 x 20,000 bushels = $73,000). Profit amounts to $20,000 ($73,000 - $53,000 = $20,000). However, the wheat manufacturer needs to liquidate its position at the futures market by buying 5 futures contracts with a total amount of $86,000 ($4.30 x 20,000 bushels = $86,000), which is $20,000 (86,000 $ - 66,000 $ = $20000) more than the price of the contracts at the moment of their sale. The loss on the futures market experienced by the wheat manufacturer amounts to - $20,000 $ (66,000 $ - 86,000 = - $20,000). Likewise, at this very example, there is also a perfect hedge, for the loss at the futures market completely equals the profit at the cash market.

The flour manufacturer made a profit of $20,000 at the futures market because it bought 20,000 bushels of wheat at a price of $3.30 per bushel for a total of $66,000, which would have cost $86,000 ($4.30 x 20,000 bushels = $86,000) at the time of hedge placement. However, the flour manufacturer suffered a loss at the cash market because he had to pay $20,000 more to get 20,000 bushels of wheat. The value of 20,000 bushels of wheat on the cash market has increased from $53,000 ($2.65 x 20,000 bushels = $53,000) to $73,000 ($3.65 x 20,000 = $73,000).

Through the use of hedge, the flour manufacturer saved $20,000, whereas the wheat manufacturer would have done better if he had waited and not placed hedges. However, both the wheat and flour manufacturers used hedge to protect them against unforeseen price changes at the cash market.

The two above situations presupposed that the basis risk remained unchanged. However, in reality, the basis is frequently changed between the moment of hedge placement and the moment it is raised. It is therefore necessary to consider what happens once the basis risk changes.

If it is assumed that the cash price of wheat drops to $2.10, as in the first case, and that the futures prices drop to $2.95 instead of $2.75, the basis would then drop from - $0.65 to – $0.85 ($2.10 - $2.95 = - $0.85). Short (selling) hedge loss of $11,000 at the cash market has only been partially remedied by the profit on the futures market of $7,000.

Consequently, hedge result was an overall loss in the amount of $4,000. However, two important aspects should be mentioned. First, if the wheat producer had not reached for the hedge, the loss could have been $11,000, since the value of its 20,000 bushels of wheat was $42,000 in comparison to $53,000 six months ago. Although it is not a perfect hedge, the loss of $4,000 is less than the possible loss of $11,000 that would have been suffered if the hedge had not been used. Similarly, the flour manufacturer is faced with the same

problem from the opposite perspective. Namely, it would have accomplished a total profit of $4,000 from its long (buying) hedge. The profit of $4,000 is a result of the profit achieved on the cash market in the amount of $11,000 and the loss of $7,000 suffered on the futures market.

5. Conclusion

On the basis of the above example it can be said that the basis does fluctuate and that, therefore, it cannot remain constant during the period within which risk is affected. Fluctuations of the basis brought the basis risk the participants failed to face. Thus, the unchanged basis does not affect the basis risk, therefore bringing neither profit nor loss to the participants. However, changes in the basis caused the emergence of the basis risk which brought loss upon the wheat manufacturer, and profit to the flour manufacturer, even though both were faced with the same problem. In order to reduce the intensified effect of basis risk onto hedging transactions with futures by changing the basis, the participants' task is to correctly define their strategy and plans by properly choosing a futures contract that would be used for hedging.

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UTICAJ BAZNOG RIZIKA NA ORGANIZOVANJE HEDŽING TRANSAKCIJA SA FJUČERSIMA

Rezime: Kada je reč o hedžing transakcijama treba istaći da njih u praksi nije lako organizovati. Visina dobitka i gubitka u hedžing transakcijama određuje se postojećim odnosom između keš i fjučers cene u momentu upisa i momentu dospeća hedžinga. Na fjučers berzama hedžeri treba da kontinuirano ulaze u transakcije kako bi osigurali svoju buduću poziciju na promptnom tržištu. Pri definisanju svoje strategije najveći rizik sa kojim je hedžer izložen je bazni rizik *(basis risk)*. Razlika koja nastaje između keš i fjučers cene naziva se baznim rizikom. Cilj istraživanja u ovom radu je da se sagleda u kom slučaju se pojačava intezitet uticaja baznog rizika na organizovanje hedžing transakcija sa fjučersima i utvrdi odlučujući faktor koji utiče na bazni rizik koristeći se primerima hedžing transakcija sa fjučersima.

Ključne reči: hedžeri, hedžing transakcije, bazni rizik, keš cena, fjučers cena.