CHOICES IN INTEREST RATE RISK MANAGEMENT PROCESS

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Abstract

The purpose of this paper is to highlight the presence of interest rate risk at the level of non financial companies, risk which, although incidental, affects the decision process in its core; and to offer modern management solutions, in order to support the managers that underlie the investment financing decisions at the level of these companies. Methodologically, the research has been done mainly as a quantitative intercession, with estimates and tests of inductive type and appeal to adequate techniques of analysis and reading off. The results of research reveal the placing of estimation and interest rate risk management in the decision making problems of non financial company; the setting-up of interest rate risk management into a suitable algorithm developed on logical steps; the structured analysis of the derivatives for the interest rate risk management; the growth of applied component, as an actual way to estimate and test the acquired results. As a result of the research, we can draw the conclusion that the efficient management of the interest rate risk depends on the moment in which the tools we use interfere with the risk management decisions and on the way in which the management strategies answer to each manager's own decisions.

Key words: management, interest rate, risk, derivatives

INTRODUCTION

The management of interest rate risk is part of the broader function of risk management at the level of a company. Even the companies outside the banking and financial sectors become more aware of the need to actively manage the risks incumbent on them. The risk management and business management become inseparably. Making choice of the most suitable approach of the interest rate risk management, the risk manager must know which are the available ways to assess the risks: from sparing or accepting, to diversification or hedging. The hedging technique's goal is to neutralize and remove the risk, as compared to diversification, which follows rather its reduction. Thus, for non-financial companies, the hedging with derivative tools headed the previous practice of diversification. Generally, the interest rate risk management using the techniques of hedging with derivatives allows a company to obtain the estimated revenues from transactions or other operations influenced by the change in interest rate, on the success of which they are dependent.

MATERIAL AND METHOD

Decision making presumes to get through several preliminary stages within the interest rate risk management process: from identifying the risk types that economic agent faces with, grouping and sorting out the manageable ones, passing through their analysis and quantification, continuing with the examination that can take different shapes [1] (sparing, acceptance, transfer, diversification, covering etc.) and monitoring of examination strategies, to the assessment of the results. Thus, the decisions affecting the future and on which the efficiency and effectiveness of the risk management process depend, are the ones adopted in the examination stage.

The examination of a position exposed to the interest rate risk is achieved by adopting an opposed and equal position, either through traditional measures, or through operations on capital market [4].

Both categories of operations generate additional costs bore by the society in the form of an insurance premium against the interest rate risk.

Traditionally, a company opted for the revision of *contractual regulations* on the claims and debts at maturity, setting one's sights on the possibilities of early reimbursement/ redemption of the debts/investment or on renegotiate the interest rate, in the case of an unfavorable change of it. When in the company's balance there is a trade-off for the positions that are sensitive to interest rate, one can act *to eve up the claims and debts* at the same maturity. The protection against the interest rate risk can be done through *the immunization* of each claim and debt at maturity. This assumes each of them to be contracted in terms that make the immunization period and its maturity equal.

Operations on capital market using derivatives that have as support assets sensitive to interest rate represent the newest and most dynamic tool for interest rate risk management.

The derivatives are complex products and their use assumes knowing in detail their features, developing and use of proper assessment techniques and mechanisms, and expertise. Moreover, one must keep in mind that any model, no matter how sophisticated, offers only a partial representation of reality and can generate a result only for the environment he recovers. The decisions belong at each level to the people, the expertise being an important element in this equation.

The implementation of any interest rate risk examination strategy using derivatives implies several preliminary steps to be taken by the risk manager:

1. *Determining the objectives of the strategy*

The tools for risk measurement provide the information concerning the potential loss of a position. Having this information, the manager can determine what is expected from the strategy of risk examination. If the goal intended through the strategy consists of the compensation of the effect of an adverse change in the price of basic asset or liability through the result of the position on the derivative's market, then the strategy is called *hedging* [2].

2. *Determination of the most suitable tool to be used in the risk's examination*

In order to control the interest rate risk of a position or portfolio, one must initiate a position on another tool or tools. The most important category of such tools integrates the derivate financial products or derivatives. The first factor in determination of the tool or tools that should be use in controlling the risk is the *correlation degree* between the interest rate on which is based the derivative tool and the interest rate that creates the support risk that manager intends to cap. In addition, for a position that request liquidity, one doesn't want the risk to be controlled by an instrument with a reduced liquidity or an instrument whose value is determined solely by a counterparty.

3. *Determination of the position that should be taken in the case of chosen tool for risk's examination*

Once chosen the risk's examination tools and the goals of the strategy, one must determine the position that is to be taken in the case of the tool, namely the two dimensions of the position: the type and the size. The position's type refers to *the orientation of the operation* that is to be initiated on the derivate tool: sell (short position) or buy (long position). For instance, if one wants to decrease the exposure to the interest rate risk of a long position in governmental bonds using futures contracts that have governmental bonds as support, then the most appropriate step is to initiate a short position on that futures contract. The second dimension is *the size of position* initiated on the examination tool of the selected risk. For instance, when futures contracts or bonds are used, the size of the position is represented by the number of contracts. The position's value depends on the volatility of the price of position whose risk is to be controlled.

4. *The assessment of the potential result of the risk examination strategy*

After choosing the position on the tool or tools for risk examination, the next step is the determination of the potential result of the strategy. Most of the times this step asks for

the determination of the strategy's result for different scenarios that take into account different levels of the future interest rate. The analyzed scenarios can be compared later to the goals set for the risk examination strategy. One can notice, for instance, that in the case of some scenarios the goals can be met, while for others, the results of risk examination strategy can be below the results of the situation when anything would be done.

In order to analyze the way in which the interest rate risk management strategies using derivatives respond to the goals set by the risk manager, we opted for three strategies: hedging with futures contracts, buying PUT options and selling CALL options applied to the same spot position exposed to the interest rate risk.

Hedging with futures contracts means to initiate a futures position, as a temporary substitute for a transaction that will take place in the future on the cash market. If prices on demand and futures change in the same time, then any loss made by hedger at any position, either cash or futures, will be compensated by the profit made at the other position. Hedging is a special case of examination of the interest rate risk. The risk manager follows *a duration equal to zero*. [3]

The most frequently met case is the one in which the asset held spot, whose risk must be hedge, is not identical with the asset supporting the futures contract. This type of hedging is known as *cross-hedge*. In the analysis, one wants to hedge in July this year the interest rate risk pertaining to a portfolio of corporate bonds on long term (coupon 11.75%, maturity in 2029, nominal value of 10,000,000 units) that the company intends to sell at the end of September, in order to make available funds necessary for a new project. The risk manager must cover himself against the risk of interest rate increase till the end of September, fact that would lead to the decrease of the bonds' selling price. As the derivate tools having as support the corporate bond held as spot can't be found on the market, the risk manager goes toward a largely traded type of contract, whose reference asset has a price variation very close to the price variation of the held bond. Thus, he chooses to sell futures contracts for treasury bonds, with maturity in September this year, in order to cap the selling of corporate bonds. In this situation, one can talk about a cross-hedge, because the reference asset of the chosen contract is not the same to the asset whose interest rate risk is capped.

The information given by the stock exchange at the date of hedging strategy's initiation are the following: the corporate bond is traded at a 12.4% yield; the futures price of the contract on treasury bonds, maturity in September is 70, the nominal value is 10,000,000 units and the conversion factor for the deliverable bond is 0.9660; the deliverable bond, coupon of 7.625%, maturity in 2029 is "the cheapest at the delivery" of futures contract on treasury bonds, in September this year and is traded at an yield of 11.50%.

Because the conversion factor is 0.9660, *the target price of hedging strategy* is 70 * 0.9660 = 67.62 and the expected yield is 11.789% (yield at a price of 67.62). The expected yield for the held corporate bond is 11.789% + 0.90% = 12.689%, corresponding to a selling price effectively blocked at *92.628*.

At these target levels, the value of absolute period, at a change by 50 basic points of the interest rate is of 2.8166% for the deliverable bond and 3.6282% for the corporate bond. As a result, at a nominal value of 10,000,000 units of the bond whose risk must be capped, the absolute period is 3.6282% * 10,000,000 units = 362,820 units; and at a nominal value of 100,000 units of the deliverable bonds, the absolute period is 2.8166% * 100,000 units = 2816.6 units.

*The number of futures contracts (hedging rate) = 0.9660 * (-362,820 / 2816.6)=-124 contracts*

One must sell 124 futures contracts on treasury bonds in order to cap the interest rate risk generated by the spot position held on corporate bonds, succeeding thus *to block a selling price of 92.628*.

In order to test the strategy, one can determine the result for different scenarios that take into account different levels of the future interest rate, during July – September, reflected in the price of corporate bond in the last day of maturity month:

Table 1
The target rate in a strategy of cross-hedge with futures contracts on treasury bonds

Value of corp. bond at selling	Yield of corp.bond at selling %	Yield of deliverable bond *	Price of deliverable bond	Futures price**	Fin. result for 124FC	Total financial result
7 600 000	15,468	14,568	54,590	56,511	1 672 636	**9 272 636**
8 000 000	14,696	13,769	57,741	59,773	1 268 148	**9 268 148**
8 400 000	13,996	13,096	60,887	63,030	864 280	**9 264 280**
8 800 000	13,359	12,459	64,018	66,271	462 396	**9 262 396**
9 200 000	12,776	11,876	67,134	69,497	62 372	**9 262 372**
9 600 000	12,240	11,340	70,233	72,705	- 335 420	**9 264 580**
10 000 000	11,745	10,845	73,312	75,892	- 730 608	**9 269 392**
10 400 000	11,287	10,387	76,364	79,052	-1122448	**9 277 552**
10 800 000	10,861	9,961	79,394	82,188	-1511312	**9 288 688**
11 200 000	10,463	9,563	82,403	85,303	-1897572	**9 302 428**

* The yield of deliverable bond is kept at a distance of 90 basic points against the corporate bond's yield, i.e. they evolve in parallel (the difference between the two yields is constant in time, respective 12.40% - 11.5% = 0.90%).
**Through convergence, the futures price equals the price of the deliverable bond divided by the conversion factor 0.9660

By adding in the last column the results from the two markets, spot and futures, one obtains values very close to 9,262,800 units, meaning a price of 92.628 for the sold corporate bonds, identical to the price that the manager blocked as target price of the strategy.

In the second strategy, the risk manager uses options on futures contracts, instead of futures contracts, in order to protect himself against the rise in interest rate. The strategy he must use in this case is the buying of PUT options or ***long PUT*** [5]. A first step consists of selecting the strike price for the chosen option as tool of interest rate risk management. First of all, the risk manager must determine the minimum selling price that he accepts for the bonds that are to be capped. Comparing the price the strategy with futures contracts can block, we assume that the risk manager considers a minimum acceptable a price of the bond of 87.668 that corresponds to a futures price of 66.

In the next Table there are integrated the strategy's results for a wide range of possible values of the interest rate, reflected in the price of corporate bond in the last day of the maturity month:

Table 2
Strategy of hedging with PUT options on futures contracts on treasury bonds

Value of corp. bond at selling	Yield of corp. bond at selling %	Futures price*	Value for 124 PUT**	Premium for 124 PUT	Total financial result
7 600 000	15,468	56,511	1 176 636	46 500	**8 730 136**
8 000 000	14,696	59,773	772 148	46 500	**8 725 648**
8 400 000	13,996	63,030	368 280	46 500	**8 721 780**
8 800 000	13,359	66,271	0	46 500	**8 753 500**
9 200 000	12,776	69,497	0	46 500	**9 153 500**
9 600 000	12,240	72,705	0	46 500	**9 553 500**
10 000 000	11,745	75,892	0	46 500	**9 953 500**
10 400 000	11,287	79,052	0	46 500	**10 353 500**
10 800 000	10,861	82,188	0	46 500	**10 753 500**
11 200 000	10,463	85,303	0	46 500	**11 153 500**

*is determined identically as in Table 1
** Value for 124 PUT = 124 * 100,000 units * 1% * max [(66 – futures price), 0]

The total financial result that allows the determination of the actual selling price of the capped bonds is computed in the last column. It is composed of the result obtained on spot market, from the selling of the bonds at the current market price and the result obtained from the exercise of the PUT option at maturity, revised with the premium paid

for options. The financial result of the transaction on the PUT options market is equal to the value of option minus the cost of the option, being about a buying. The value of the PUT option in the moment of exercise is the price of exercise minus the futures price of the support contract, everything multiplied by the nominal value of the support asset (1000 units). If the difference is negative, the buyer gives up the option, case in which its value is equal to zero. Following the last column in the table, one can notice that the actual selling price of the capped bonds never decreases below the minimum acceptable price set by the risk manager (87.668) minus the options premium at 100 units nominal value (0.465), respectively below *87.203*. *This minimum actual price* can be calculated by the risk manager before the hedging strategy to be initiated.

The degree in which ***the strategy of selling CALL options*** responds to the needs of covering the interest rate risk [5], in the case of the same portfolio of corporate bonds, is pursued in Table 3. The strategy starts from a price of future contracts on treasury bonds of 71-24 at the date of hedging initiation, case in which the selling of CALL options on future contracts is good to be done at the price of exercise of 78, receiving in exchange a premium of 24 points. The number of contracts of sold options will be the same, 124, for a nominal value of 10,000,000 units of the corporate bonds spot held. For the same range of possible prices of the bond at the option's maturity, based on the way the interest rate fluctuates, the obtained results are integrated in the following table:

Table 3
Strategy of hedging with CALL options on futures contracts on treasury bonds

Value of corp. bond at selling	Yield of corp. bond at selling %	Futures price*	The amount due for 124 CALL**	The premium for 124 CALL	Total financial result
7 600 000	15,468	56,511	0	46 500	**7 646 500**
8 000 000	14,696	59,773	0	46 500	**8 046 500**
8 400 000	13,996	63,030	0	46 500	**8 446 500**
8 800 000	13,359	66,271	0	46 500	**8 846 500**
9 200 000	12,776	69,497	0	46 500	**9 246 500**
9 600 000	12,240	72,705	0	46 500	**9 646 500**
10 000 000	11,745	75,892	0	46 500	**10 046 500**
10 400 000	11,287	79,052	- 130 448	46 500	**10 316 052**
10 800 000	10,861	82,188	- 519 312	46 500	**10 327 188**
11 200 000	10,463	85,303	- 905 572	46 500	**10 340 928**

*is determined identically as in Table 1
**The amount due in the sold CALL contract computed as 124 * 100 000 USD * max [(futures price - 78), 0]

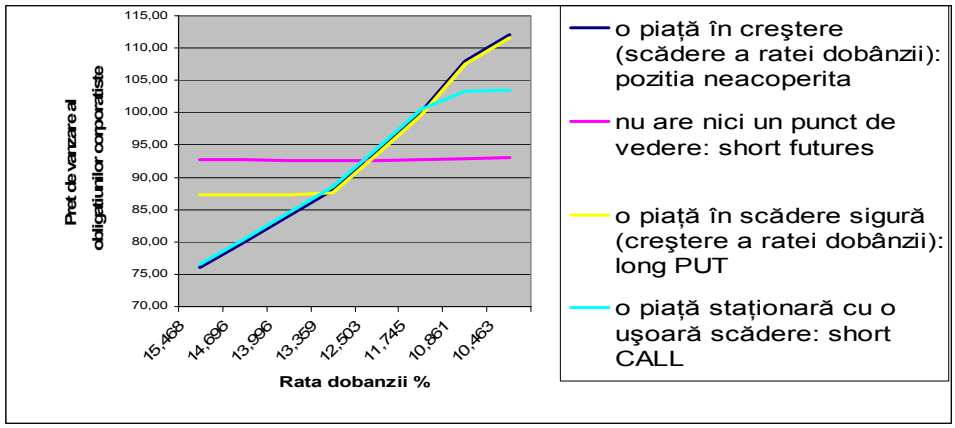
The selling actual maximum price in the case of CALL capping strategy can be computed before launching the strategy. It is equal to the price of the capped bond corresponding to the price of exercise of the sold option, plus the received premium. In the given example, the price of exercise of sold CALL option is 78. Multiplying the price of exercise by the conversion factor 0.966 we get the price of the cheapest bond at the dissolution of the futures contract underlying the option, 75.348 respectively. This price corresponds to a yield of 10.536% for the deliverable bond. The equivalent yield for the corporate bond is 90 basic points higher or 11.436%, corresponding to a price of 102.666. Adding the received premium of 0.465 basic points, one obtains the price of 103.410. This price is the maximum possible for the actual price of selling the bond to be hedged.

RESULTS AND DISCUSSIONS

Comparing the alternate strategies we've proposed for hedging the interest rate risk faced by the investor that possesses a corporate bond portfolio, we can draw a conclusion on the way in which the strategies for interest rate risk management with

derivatives offered by stock market, regulated, respond to the goals of each risk manager. The results of the three proposed strategies: hedging with futures contracts, hedging with PUT options and hedging by selling CALL options are integrated in the following graph:

Figure 1 – Comparison between the results of the alternate strategies of capping the interest rate risk by derivate financial products



- If the manager anticipates ***a market in sure decrease for the support asset*** (increase of interest rate) or basically "bearish", ***buying a PUT option*** and paying the premium is the right strategy. Buying the PUT option offers the possibility to obtain an unlimited gain at a decrease of support asset's price (an increase of interest rate), that compensates the loss on the spot market. If the evolution is not as expected (the interest rate decreases), but favorable to the cash position because it assimilates to the growth of the prices of titles in portfolio, the gain on spot market is adjusted with the premium paid for the PUT's procurement. The hedging with PUT option allows to the investor to make profit from the growth of prices (the interest rate decrease), offering the necessary protection against their decrease (increase of interest rate) as well. The PUT protection strategy ensures the selling minimum actual price of the bonds in portfolio (87.203 in the given example) before the initialization of the strategy, as being the minimum acceptable price set by the risk manager minus the premium.

- If, in exchange, he anticipates ***a stationary market with a slight decrease***, then is better to cash the premium into a strategy of ***selling the CALL***. This strategy doesn't limit the level of potential losses at an unfavorable evolution of interest rate, reason for which many managers do not consider it a strategy of covering the risks. However, the potential losses are smaller than the ones generated by the unfavorable movement of the interest rate on the unhedged cash position. The difference comes from the premium cashed from the buyer through the sale of the CALL option. The premium acts as a buffer for the downward movement of the prices, reducing the losses when the rate increases. The cost of this buffer is that the manager gives up the potential gains generated by a reduction of the interest rate, because his revenues have a ceiling in this strategy. The selling actual maximum price in the case of CALL hedging strategy can be computed before the launching of the strategy and it is equal to the price of the capped bond corresponding to the price of exercise of the sold option, plus the cashed premium (103.410 in our example).

- If he has ***no point of view regarding the future evolution of interest rate***, but he wants to cap the risk at all costs, then he will have to access ***the futures market***. The futures strategy allows him to block the selling price of the support asset (92.628 in our example), no matter the interest rate evolution. One

avoids thus the potential losses, but does not allow to the operator to benefit from the favorable evolution of the interest rate: the gain from the cash market will be annihilated by the loss on the futures market.

- There is yet the situation in which the prevision of the interest rate evolution indicates ***a growing market for the held asset*** or "bullish", case in which ***initiating no hedging position*** is the best strategy.

CONCLUSIONS

One cannot say that one or another interest rate risk hedging strategy using derivatives is „the best" or „the most correct" one. Each strategy has its advantages and disadvantages. In order to choose one of them, one must analyze them and compare them to the goals of each risk manager. The best strategy and the best strike price depend upon the point of view of the manager regarding the market evolution. The manager responsible with the selection of strategy has his own perspective on the market, based on which he will act on the parallel derivative market.

The derivatives are complex products and their use assumes knowing in detail their features, the development and use of several proper techniques and mechanisms for assessment, and expertise. In addition, one must keep in mind that any model, no matter how sophisticated, offers only a partial representation of reality, and the model can generate a result only for the environment he recovers. The decisions belong to people at each level, the expertise being an important element in this equation.

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