STOWARZYSZENIE EKONOMISTÓW ROLNICTWA I AGROBIZNESU
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Katarzyna Banasiak

Warsaw University of Life Sciences – SGGW, Poland

CURRENCY HEDGING STRATEGIES FOR POLISH AGRI-FOOD EXPORTERS – APPLICATIONS OF DERIVATIVE INSTRUMENTS

STRATEGIE ZABEZPIECZANIA POLSKICH EKSPORTERÓW PRODUKTÓW ROLNO-SPOŻYWCZYCH PRZED RYZYKIEM WALUTOWYM – ZASTOSOWANIE INSTRUMENTÓW POCHODNYCH

Key words: currency risk hedging, vanilla option, exotic barrier option, option strategy
Słowa kluczowe: zabezpieczanie ryzyka walutowego, opcja waniliowa, barierowa opcja egzotyczna, strategia opcyjna

Abstract. The aim of the paper is to display and compare two options strategies which may be applied in hedging currency risk. It considers Polish agri-food companies which export their products to Eurozone countries. Their functioning and profitability is affected by PLN/EUR exchange rate fluctuation. In the paper the applications of financial vanilla and exotic options in hedging currency risk are presented. It is shown that the risk reversal strategy with barrier option reflects better hedging results than the synthetic short forward strategy which involves only the standard vanilla options.

Introduction

Unpredictable exchange rate movements have been the main feature of international economic environment since the collapse of the Bretton Woods System. High exchange rate volatility has affected the value of the firms. The corporate cash flows have been sensitive to exchange rate fluctuations. It altogether has spurred the development of currency hedging instruments such as derivatives. Nowadays the implementation of derivative instrument by firms have become common practice in the risk management activities [Bartram et al. 2003]. Companies may choose between the various financial derivatives like forwards, futures, swaps and options. Full-hedging theorem states that the companies should fully eliminate risk exposure by adopting a full hedge on condition that forward/futures markets are unbiased. It implies that other hedging instruments such as options are redundant [Lapan et al. 1991]. However, many researchers stress the positive role of options in hedging currency risk. Sakong at al. [1993], Brown et al. [2002], Wong [2003a] and Lien, Wong [2004] show that firms facing risk which cannot be fully hedged should apply options in their currency hedging strategies. According to Broll et al. [2001] options are used to gain better hedging performance. It derives from the existence of a nonlinear components in the spot-futures exchange rate relationship. The merits of using options in hedging currency risk are also pointed out by Wong [2003b].

The paper considers the Polish agri-food companies which export their products to countries in the European Union. The frame of research is a risk-averse firm which produces a certain agricultural commodities or food in the Polish market and exports it to Eurozone countries under exchange rate uncertainty. There are many financial techniques that can be applied by the firm to hedge its exposure to changing PLN/EUR exchange rate. This study displays the chosen options strategies which can be employed in hedging currency risk. The aim of the paper is to compare the hedging results of the basic option strategy to the strategy which involve the exotic barrier option.

The remainder of the paper is organized as follows. Section 2 covers the field of research and examines the changes in structure of Polish foreign trade. Section 3 describes two alternative currency hedging options strategies. The first one involves the standard put and call vanilla options. The second one contains both the standard and exotic barrier options. Section 4 offers some concluding remarks.

The field of research

The global financial crisis which began to affect Polish economy at the end of 2008 brought about huge changes in international trade. Poland's main trade partners suffered economic problems. The decline in their domestic demand highly hampered Polish export. However, from the beginning of 2009 Polish import started to decrease at a rate exceeding that of export. It altogether resulted in decrease of the trade deficit (-8.7 billion EUR in 2009 versus -26.2 billion EUR in 2008). Moreover, Polish currency's depreciation brought about an increase in price competitiveness of Polish export. During the first half of 2010 Polish export has grown 19.2% compared to the first half of 2009.

Products of agricultural and food industry play an important role in Polish trade balance. They have accounted for about 7% to 10% of foreign trade over the last few years. The balance of Polish agri-food trade has improved over the year 2009 and the first half of 2010 (2.1 billion EUR in 2009 versus 1.4 billion EUR in 2008; 1.3 billion EUR in I-VI 2010 versus 1.1 billion EUR in I-VI 2009). Polish agri-food export has increased in the first half of 2010 about 9% to almost 6.2 billion EUR. It is worth to emphasize that 4.92 out of 6.2 billion EUR accounts for the export to EU countries[1].

Taking into account the fact that Polish agri-food export volume is becoming bigger and bigger it seems to be important to deal with the problem of exchange rate risk. The paper is focused on the Polish exporters who sell their agricultural and food products to Eurozone countries. Their functioning and profitability is affected by PLN/EUR exchange rate fluctuation. They face positive currency exposure when Polish currency depreciates. However, when the PLN/EUR exchange rate decreases the firms are likely to lose highly. The risk often arises when they sell its products on credit, so they receive payment after a delay such as 60. 90 or 120 days. There is a risk for a company that the exchange rate will move in an unfavorable directions during the period of credit granted. Those firms can employ various financial techniques to hedge its exposure to changing PLN/EUR exchange rate. The paper presents two options strategies which may be applied in hedging currency risk.

Options strategies in hedging currency risk

Financial derivatives are instruments which value depends on the price of underlying financial assets. Financial derivatives are used by market participants to hedge against adverse changes in value of financial assets. There are four main types of financial derivatives: financial forwards, financial futures, financial swaps and financial options [Jajuga, Jajuga 2008]. In the paper the applications of financial options in hedging currency risk are presented. Options give the buyer the right, but not the obligation, to buy or sell the underlying asset when the market price is worse than the strike price. We can point out two main types of options: call options and put options. A call option gives the owner a right to buy an underlying instrument at a certain price. A put option, in turn, gives the owner the right to sell an underlying asset at a specified price. Moreover, among the options we can distinguish standard vanilla options and exotic options. In the paper the application of conventional vanilla option and exotic barrier option is presented.

Barrier options are vanilla options with the additional barriers. The payoff of barrier options depends on whether the underlying asset's price reaches a specified level during a certain period of time. Barrier options are classified into knock-in and knock-out options. Knock-in options start to exist when they reach a certain level. When the price of underlying asset crosses the barrier, the knock-in option is activated and becomes the standard vanilla option with the same strike price and expiration date. Knock-out options cease to exist once the barrier level is reached. As long as the price of underlying asset does not cross the barrier, the knock-out option remains the standard vanilla option. However, if the price of underlying asset crosses the barrier, the option is knocked out and expires worthless [Pruchnicka-Grabias 2006]. The barrier can be established on different levels. When the barrier is set "out-of-the-money"[2] then the barrier option is called straight knock-in/knock-out. However, when the barrier is set "in-the-money"[3] then the option is entitled reverse knock-in/knock-out.

To hedge against the risk arising due to the exchange rate fluctuations the exporters may employ following options strategies:

– Synthetic short forward strategy,
– Risk reversal with knock-in strategy.

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[1] Data from Foundation of Assistance Programmes for Agriculture (FAPA).
[2] Below strike price for a call option and above strike price for a put option.
[3] Above strike price for a call option and below strike price for a put option.

The first strategy is built with standard vanilla options. It is established by buying put option and writing call option for the same specified amount, date of maturity and strike price. The second one contains standard vanilla put option and exotic barrier call option. This strategy is established by buying put option and writing reverse knock-in call option. By using these strategies exporter is likely to reduce its cost of hedging currency risk. The cost of buying put option may be partly offset by the premium received from writing the call option. This is the crucial merit of those strategies because very often exporters are reluctant to hedge currency risk due to the cost disadvantage. Moreover, the exporters are protected against adverse movements on the currency market. However, the gains due to favorable exchange rate movements are limited.

Taking into consideration the Polish exporter who sell its products to Eurozone countries, the synthetic short forward strategy consists of the simultaneous purchase of PLN/EUR put option and selling PLN/EUR call option with the same strike price Q. As a buyer of put option the exporter has a right to sell EUR at the strike price Q and as a seller of call option the exporter has an obligation to sell EUR at the strike price. If the PLN/EUR market price (S) at expiration is below the strike price Q the exporter will exercise his right to sell EUR at Q level. It protects him from any decline of PLN/EUR below the exchange rate Q. However, when at expiration the PLN/EUR market price (S) is above the strike price the exporter will be forced to sell euro at the strike price Q. In this situation he will not take advantage of favorable movements in the PLN/EUR market. As a result the exporter will sell euro at strike price Q regardless of the PLN/EUR market price (S).

As far as the risk reversal with knock-in strategy is concerned it embraces the simultaneous purchase of PLN/EUR put option at the strike price Q and selling PLN/EUR reverse knock-in call option at the strike price Z, where Q is lower than Z. The barrier B is set above strike price Z. The payoff of the strategy depends on whether the market price (S) breaches the barrier level B. If the knock-in barrier exchange rate has been reached the option becomes the plain vanilla call option with the strike price Z. In this situation the payoffs at expiration of the strategy are following if the market price S is:

– below exchange rate Q, the exporter will exercise his right to sell euro at the strike price Q,
– between exchange rate Q and Z, the exporter will sell euro at the market price S,
– above exchange rate Z, the exporter will be obliged to sell euro at the strike price Z.

On the other hand, if the knock-in barrier has not been reached the call option would expire worthless. In this case the payoffs at expiration of the strategy are as follows if yhe market price S is:

– below exchange rate Q, the exporter will exercise his right to sell euro at the strike price Q,
– between exchange rate Q and Z, the exporter will sell euro at the market price S,
– above exchange rate Z, the exporter will sell euro at the market price S.

The Table 1 presents the possible scenario of the PLN/EUR bid exchange rate level at expiration and the exchange rate at which exporter would sell euro for covered strategies. One can assume that the strike price Q and Z are equal respectively 4.1500 and 4.3000. The barrier B is set at the level 4.5500. The exporter will receive 100,000 euro within 3 months. The synthetic short forward strategy (strategy I) consist of simultaneous purchase of a 3 month PLN/EUR put option and selling a 3 month PLN/EUR call option with the same strike price 4.1500. The risk reversal with knock-in strategy (strategy II) embraces simultaneous purchase of PLN/EUR put option at the strike price 4.1500 and selling PLN/EUR reverse knock-in call option at the strike price 4.3000 with barrier 4.55.

These strategies are suited for those who require reduced cost of hedging currency risk. In both of them the cost of buying put option is partly offset by the premium received from writing the call option. In the synthetic short forward strategy exporter will not take advantage of favorable movements of exchange rate. However, it protects him from any decline of PLN/EUR below the 4.1500 exchange rate. Consequently, he will sell euro at strike price 4.1500 irrespective to the PLN/EUR market price at expiration. Nevertheless, the risk reversal with knock-in strategy seems to provide better PLN/EUR exchange rate for the exporter. In the situation when knock-in barrier has been reached the exporter would sell euro in the range between 4.1500-4.3000. In turn, when knock-in barrier has not been reached he would sell at price from 4.1500 to almost 4.5500.

Table 1. The payoffs of analyzed options strategies at different PLN/EUR market price at expiration
Tabela 1. Rozliczenie rozważanych strategii opcyjnych przy różnym poziomie rynkowego kursu walutowego PLN/EUR w dniu wygaśnięcia opcji

PLN/EUR bid exchange rate at expiration (S)/ ***Rynkowy kurs walutowy PLN/EUR w dniu wygaśnięcia opcji***	**PLN/EUR bid exchange rate at which exporter would sell euro at expiration/** ***Rynkowy kurs walutowy PLN/EUR w dniu wygaśnięcia opcji po którym eksporter mógłby dokonać transakcji***		
	Strategy I/*Strategia I*	**Strategy II – knock-in barrier has been reached/** ***Strategia II – bariera wejścia została osiągnięta***	**Strategy II – knock-in barrier has not been reached/** ***Strategia III – bariera wejścia nie została osiągnięta***
3.4000	4.1500	4.1500	4.1500
3.7000	4.1500	4.1500	4.1500
3.9000	4.1500	4.1500	4.1500
4.0500	4.1500	4.1500	4.1500
4.1600	4.1500	4.1600	4.1600
4.2300	4.1500	4.2300	4.2300
4.3100	4.1500	4.3000	4.3100
4.4500	4.1500	4.3000	4.4500
4.5400	4.1500	4.3000	4.5400
4.8500	4.1500	4.3000	-
5.0000	4.1500	4.3000	-

Source: own study
Źródło: opracowanie własne

Conclusions

1. The Polish export of agriculture and food products has been growing over the year 2009 and the first half of 2010. The agri-food export has increased in the first half of 2010 about 9% to almost 6.2 billion EUR. 4.92 out of 6.2 billion EUR accounts for the export to EU countries.
2. The functioning and profitability of Polish exporters selling their products to Eurozone countries is affected by PLN/EUR exchange rate fluctuation. They face positive currency exposure when Polish currency depreciates. However, when the PLN/EUR exchange rate decreases the firms are likely to lose highly.
3. Among the options strategies which can be used in hedging currency risk the Polish exporter may apply synthetic short forward strategy or risk reversal with knock-in strategy. By using these strategies exporter is likely to reduce its cost of hedging currency risk. The cost of buying put option may be partly offset by the premium received from writing the call option.
4. By using the synthetic short forward strategy an exporter will sell euro at options' strike price Q regardless of the PLN/EUR market price (S) at expiration.
5. The risk reversal with knock-in strategy provides better PLN/EUR exchange rate for the exporter The payoff of the strategy depends on whether the market price (S) has reached the barrier level B. In the situation when knock-in barrier has been reached the exporter would sell euro in the range between the strike prices of put and call options. In turn, when knock-in barrier has not been reached he would sell at strike price of put option to almost the barrier level B.

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Streszczenie

W artykule zaprezentowano i porównano dwie strategie opcyjne wykorzystywane w zabezpieczaniu ryzyka zmian kursu walutowego. Przedmiotem badań był polski eksporter produktów rolno-spożywczych prowadzący wymianę handlową z krajami strefy euro. Zarówno opłacalność sprzedaży, jak i konkurencyjność tych firm zależała od zmienności cen na rynku (PLN/EUR). W artykule przedstawiono zastosowanie opcji waniliowych i barierowych opcji egzotycznych w zabezpieczaniu wyniku z działalności operacyjnej eksportera. Wykazano, iż strategia „risk reversal", w skład której wchodzi także egzotyczna opcja barierowa daje lepsze rezultaty niż zawierająca tylko opcje waniliowe strategia „synthetic short forward".

Corresponding address:
M.sc. Katarzyna Banasiak
Warsaw University of Life Sciences – SGGW
Faculty of Economic Sciences
Nowoursynowska Str. 166
07-787 Warsaw, Poland
tel. +48 512 139 021
e-mail: katarzyna_banasiak@sggw.pl