

How to Use Financial Derivatives Wisely

- A case study of KIKO - 1

Jungsoon Shin · Yejin Lim

Abstract This case study investigates the KIKO currency option that has been a social issue in recent years among developing countries, especially Korea, where the financial derivatives market is in a state of rapid growth. The forward transaction which becomes a basis of derivatives is intended to hedge risks that may be caused by a future change in asset prices. Although it originates from a simple form of agricultural transactions, there currently exists a variety of derivatives in more sophisticated forms. In the Korean agricultural industry, the need to use such derivatives is great, as there is a huge risk of price fluctuation in agricultural products due to frequent adverse weather. In addition, many developing countries with export-led industrial structures similar to Korea's, of necessity must resort to currency hedging as a method of reducing relevant risk. However, in most cases, the lack of understanding about financial derivatives results in an inappropriate application of these derivatives. The KIKO in this study represents such cases. Since 2007, KIKO has been sold in Korea to many small- and medium-sized export companies for the purpose of currency hedging when the exchange rate between the Korean won and the U.S. dollar was in a downward spiral. The main focus of this study is a case which is most representative of KIKO.

As inflation rapidly increased during the financial crisis in the U.S. at the end of 2007, derivatives became a hot issue in the courts rather than in the financial markets. This case study investigates what KIKO and the fierce legal debates over it imply, from the perspective of the option of value evaluation in order to suggest not only a direction in which companies can utilize financial derivatives, but also a roadmap for the future derivatives market.

Keywords KIKO, Currency Option, Forward

1 Introduction

The world financial derivatives market is rapidly growing, especially in developing Asian countries such as China, India, Indonesia, Korea, Malaysia, and Sri Lanka. However, as side effects accompany any rapid economic development, the rapid expansion of the financial derivatives market reveals many potential problems. Although these problems were not as noticeable while the world economy was healthy, the financial crisis, which had a ripple-effect as it spread from the U.S. to the rest of the world at the end of 2007, made them startlingly obvious. Of particular interest here is the fact that, as the effect of financial derivatives spread to companies which were part of the general economy rather than just the financial firms, the problems of the financial derivatives market became recognized as a national issue rather than being limited to only the financial industry.

Nevertheless, it is interesting to see how such a finance-specific issue, which would normally be limited to a professional market, could affect the average small- and medium-sized companies throughout the country. Unlike its current professional image, the origins of financial de-

J. S. Shin · Y. J. Lim
Business Administration
Ewha Womans University, South Korea

J. S. Shin(✉)
e-mail : shinjs@ewha.ac.kr

Y. Lim
e-mail : imagineyj@ewhain.net

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rivatives lie in agricultural transactions which were designed as forward transactions and became the basis for financial derivatives. In the past, an agricultural producer and a distributor made a contract to sell agricultural products at a fixed price at a fixed point in the future in order to hedge any risk caused by the future price fluctuation of agricultural products. This forward transaction has transformed itself into the many current forms of financial derivatives.

It seems nowadays that only professional experts can understand the sophisticated financial derivatives we now have available. Contrary to this perception, it is possible for anyone who understands forwards and the profit structure of options, which provide the basis of derivatives, to utilize the benefits of derivatives while minimizing the damage caused by a lack of such understanding. As an example, many agricultural farms in Korea are damaged by unpredictable adverse weather every year. Whenever this happens, it is followed by a rapid price fluctuation in agricultural products which has a negative impact on the national economy as well. Because of this, the appropriate use of derivatives in the agricultural industry can help to bring stability to, not only the income of the agricultural farms themselves, but also to the national economy as a whole. This means that developing countries will require an understanding of derivatives in their agricultural industry in order to advance their economies. For many developing countries whose economies depend on export and import (i.e., Korea), financial derivatives can help small- and medium-sized export companies hedge currency risks that frequently arise in the world market.

The KIKO dispute investigated in this study represents a situation where financial derivatives were inappropriately used. The study will analyze what the KIKO currency option meant as a financial derivative and the type of disputes that have occurred concerning KIKO in recent years in Korea, in order to map a future course for the derivatives market. The study has three aspects: first, we describe the definitions and features of KIKO and analyze it in the framework of the Black-Sholes-Merton Model; second, we look at the history of KIKO disputes in Korea, and finally, we suggest what the implications of the case may be for the financial derivatives market as a whole.

2 What is KIKO?

KIKO is also called ‘KIKO Target Forward’ or ‘Window KIKO Target Forward’, and is a currency option whereby a firm buys a knock-out put option from a bank and con-

currently sells a knock-in call option. In other words, KIKO is a combination of basic options (i.e., put and call options) with other conditions (i.e., knock-in, knock-out). Export companies are constantly exposed to unpredictable currency fluctuations, and try to hedge their risk through various devices; KIKO is one of the currency options designed for that purpose.

To understand what KIKO is, it would be helpful to know the basics of what an option is. Basic options include a call option and a put option. A ‘call option’ is the right to buy an asset at a contracted price from an option-holder, while a ‘put option’ gives an option-holder the right to sell an asset at a contracted price. The underlying asset of a currency option is foreign currency. In short, the option herein means a right to sell or buy foreign currency at a contracted price.

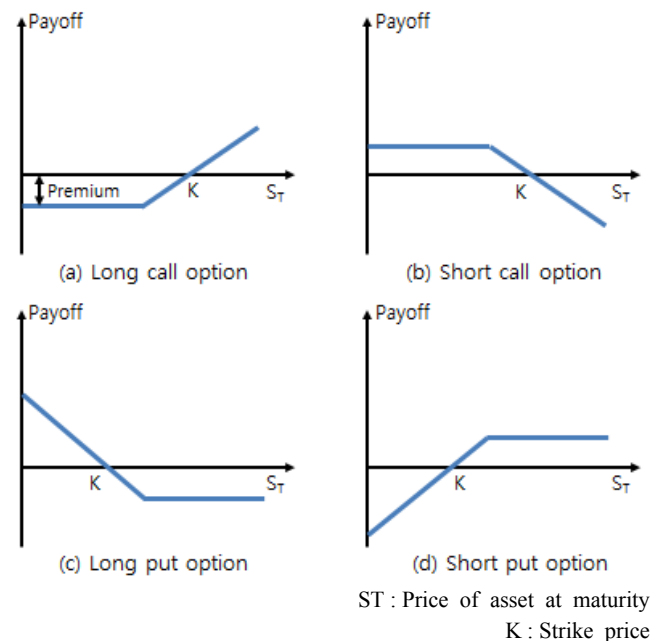


Fig. 1 Payoffs from positions in options

Buying an option (or taking a long position) transfers a future risk to the other party similar to the way in which an insurance policy works. Thus, an option-holder should pay a premium to an option-writer. Conversely, selling an option (or taking a short position) transfers the risk to an option-holder who is paid the premium. Therefore, if an option-holder sells a put option and buys a call option at the equivalent value, there is no need to pay any premium as each option offsets the other. This is referred to as ‘zero-cost’ as no premium is paid when buying a put option and selling a call option at the same time and at the equivalent value. KIKO is an option that provides certain

conditions which can meet a firm’s needs while maintaining zero-cost at the same time.

Fundamentally, KIKO is a currency option designed to allow a balance between the expected profits of a company and that of a bank. As an example, we demonstrate how to change option conditions in various ways while still maintaining the balance between the two option values in the following illustration :

The formula below represents the Black-Scholes-Merton Model that is used to value options.

$$c = S_0 e^{-r_f T} N(d_1) - K e^{-r T} N(d_2)$$

$$p = K e^{-r T} N(d_2) - S_0 e^{-r_f T} N(d_1)$$

where $d_1 = \frac{\ln(S_0/K) + (r - r_f + \sigma^2/2)T}{\sigma \sqrt{T}}$

$$d_2 = \frac{\ln(S_0/K) + (r - r_f + \sigma^2/2)T}{\sigma \sqrt{T}} = d_1 - \sigma \sqrt{T}$$

In the above formula, *c* and *p* represent the price (premium) of a call option and that of a put option, respectively. *S*₀ refers to a spot exchange rate, *K* a strike price, *r* a domestic interest rate, *r*_{*f*} a foreign interest rate, *T* maturity, and *σ* exchange rate volatility. Now let’s look at KIKO based on these elements :

2.1 Strike Price

When a domestic currency is strong, the strike price of a forward contract will be lower than a spot price at the time of contract. From the perspective of an exporter who receives export proceeds in a foreign currency, a forward contract at a strike price lower than the spot price is a way to confirm future loss when it is impossible to predict a change in future currency rates. Therefore, firms want to have a financial product which will allow them to hedge foreign exchange rate risks by increasing the strike price to some extent. However, because increasing a strike price means that a firm is more likely to increase its profits, a firm will need to pay a higher premium to the bank under such conditions. Nevertheless, KIKO allows for a zero-cost structure where a firm does not need to pay a premium, while at the same time keeping the strike price higher than the forward rate by adding other conditions. This can be done in two ways; either by adding conditions to an option, or by combining leverage with an option.

2.1.1 Adding Knock-in or Knock-out conditions

It has been mentioned that KIKO is a package option that includes a short call option and a long put option. Fig. 2 shows that the payoff of KIKO becomes equivalent to that of a short (sell) forward when a short call option and a long put option are combined.

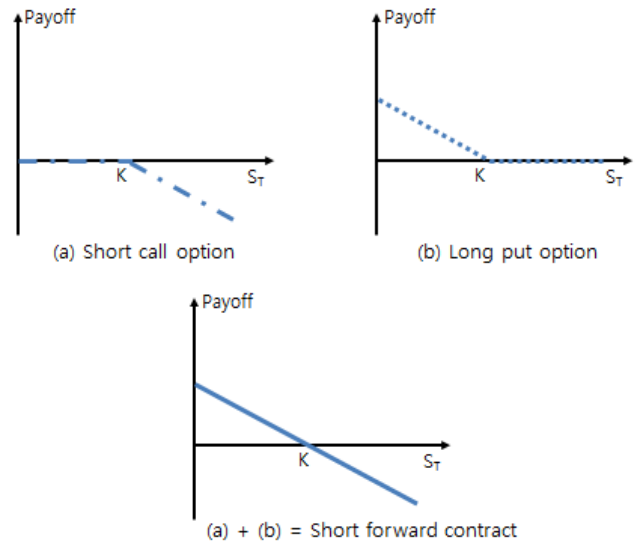


Fig. 2 Payoffs from a package consisting of a short call and a long put

Here, a put option with the knock-out condition eliminates the right to exercise a put option when *S*_{*T*} goes below *KO*. In other words, the knock-out condition for the put option reduces the value of the put option as a firm has to relinquish the profit that would be gained when *S*_{*T*} goes below *KO*. Then the premium to pay for the put option decreases and finally breaks the zero-cost structure. However, by increasing the strike price as much as the reduced value of the put option, the premium of the put option will go up and the zero-cost structure can be maintained as before.

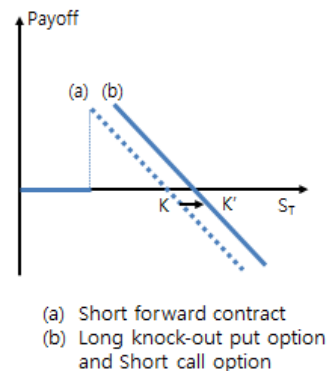


Fig. 3 Payoffs from a package consisting of a short call and a long KO put

Let's add a knock-in condition to a call option. As a firm sells a call option to a bank, a KI condition to a call option prohibits the bank from exercising a call option until S_T reaches KI . Therefore, this condition is beneficial to the firm but disadvantageous to the bank. Therefore, the strike price should be lower than the above long KO put option and the short call option.

As KIKO combines both knock-in and knock-out conditions, a firm may sustain a loss when S_T goes below KO or goes above KI . With respect to a probability distribution however, it is less likely that S_T will reach either currency level. The larger distance between KO and KI allows a higher probability for a firm to increase its profit. In this way, KIKO sets a strike price by adjusting the two types of currency rates accordingly.

2.1.2 Combination with Leverage

Another way to set a strike price is by adding a leverage condition to the contract, which makes a difference between the contract amount for a put option and a call option. As the contract amount is different for each option, the value of the two options will vary. The zero-cost structure can be maintained by adjusting the strike price as much as the value difference between the two options. The leverage rate between the two options can also be diversified. In most applications of KIKO, the contract amount of a call option is twice as high as that of a put option, which is called the KIKO Target Forward, that combines the leverage condition with the above knock-in and knock-out conditions. The following shows the profit structure of KIKO :

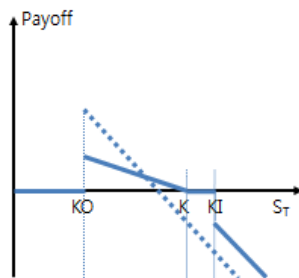


Fig. 4 Payoff from KIKO Target Forward (1)

Fig. 4 demonstrates the case where the leverage rate is set at 1:2 (put: call). As noted, KIKO provides a firm with profit when S_T is between KO and K , while letting the put option lapse under the knock-out condition when S_T drops below KO . On the contrary, a bank cannot exercise a call option under the knock-in condition before S_T reach-

es between K and KI , whereas a firm should buy U.S. dollars equivalent to twice the leverage (double in the graph) from a bank when S_T goes above KI .

Firms who have experienced losses because of KIKO argue that KIKO is an unfair contract because when the currency rate goes up, KIKO limits loss to the bank while it does not do so for a company. However, there are several things to consider when looking at that argument :

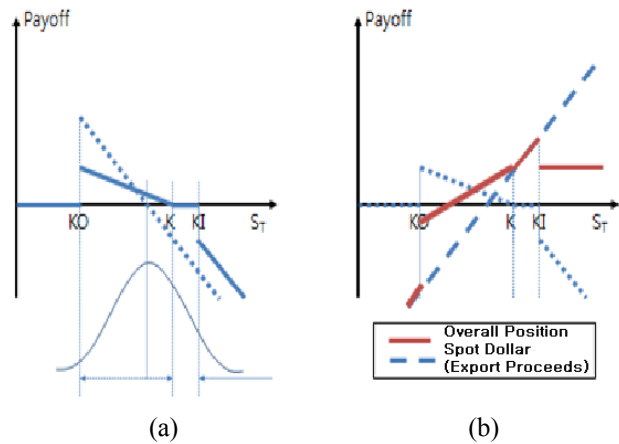


Fig. 5 Payoff from KIKO Target Forward (2)

Fig. 5 (a) shows that a firm gains a profit when S_T is between KO and K but experiences a loss when S_T goes below KO or goes above KI . In terms of a probability distribution however, it is very unlikely that a firm has a loss relatively. In other words, there is a low probability that a firm will have a huge fluctuation in currency rates when it has loss. Korean firms may underestimate the possibility of huge currency fluctuations as they experienced less fluctuation when making KIKO contracts. However, even a small probability means that the situation can occur at any time. Therefore, firms have to prepare for such possible worst-case scenarios.

Secondly, the loss from KIKO would not directly lead to an actual decrease in the cash flow of a firm. As KIKO is designed for currency hedging, a firm needs to consider spot goods (dollars) rather than profit and loss from the financial product. Fig. 5 (b) presents profit and loss when a firm makes a KIKO contract by equating the contract amount of a call option with expected export proceeds. As shown in the graph, the firm will have a loss in the product itself when S_T goes above KI . However, in consideration of the spot position as a whole, the firm's loss is not unlimited. Rather, it just gives up the exchange rate profit that could have been gained when it had the spot goods only, as the loss from KIKO is offset with the spot position. Therefore, firms could avoid large losses if KIKO

was used for hedging. However, if KIKO was contracted for over-hedging, as it exceeded export proceeds and thus became speculative, a firm's loss could be unlimited. This is the reason why many Korean firms had significant losses

from KIKO. As of 2008, approximately 71 Korean companies made KIKO contracts exceeding their expected sales amount, which unfortunately became enormous burdens to those companies when the exchange rate soared.

Table 1 KIKO Transactions of Korean Export Firms (As of June 2008)

Units : #, (\$100 million)

Classification	Number of Companies	Contract Balance (A)	Annual Export (B)	Hedging Rate (A/B,%)
Small and Medium Enterprises	480 (68)	75 (31)	190 (16)	39.5 (193.8)
Large Companies	39 (3)	26 (9)	97 (8)	26.8 (112.5)
Total	591 (71)	101 (40)	287 (24)	35.2 (166.7)

** () indicates over-hedged firms

2.2 Market Exchange Rate, Market Interest Rate, and Implied volatility

Factors that affect option values, including the spot exchange rate, foreign interest rates, and exchange rate volatility (implied volatility) reflect market information. In particular, exchange rate volatility plays a critical role in KIKO as it determines its price or as it is referred to price itself. Nevertheless, volatility cannot be observed directly. Rather, it is estimated with historical option price data in the options market. The following methods can be used to estimate volatility :

Definition:

$n + 1$: Number of observation

P_i : Option price at end of i th interval,

where $i = 0, 1, \dots, n$

r : Length of time interval in years

Let,

$$u_i = \ln \left(\frac{P_i}{P_{i-1}} \right)$$

$$S_i = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (u_i - \bar{u})^2}$$

where \bar{u} = the mean of the u_i

$$\hat{\sigma} = \frac{s}{\sqrt{r}}$$

However, such volatility varies from time to time as it implies only the expectations of the participants in the market on future status. Accordingly, option values change as well.

2.3 Maturity

As shown in the above Black-Sholes-Merton model, long option maturity basically increases in value as it is difficult to predict currency fluctuations in the long run. A short-term individual observation reduces the possibility of huge currency fluctuations from the current status (less likely to be KI or KO), that could cause a change in option values. KIKO combines several options that mature either every month or every other month, making the entire contract period longer than one year in general. The reason for referring to KIKO as 'Window KIKO Target Forward' is that the 'Window' indicates a method of limiting the short-term observation period between the previous maturity and the next maturity. Without this condition, a firm would be exposed to currency risks as all the rest of the contracts become ineffective, because the knock-out condition applies to other options as well once ST drops below KO. The window condition allows the application of a new observation period to the rest of the options from the maturity of the previously-lapsed option to the next maturity date. Consequently, for a firm with lower K, the window condition is better than the option without a window.

2.4 Transaction Cost

The above Black-Sholes-Merton Model assumes no transaction cost, which is theoretically plausible. In reality however, transaction cost is an important ingredient of option price. "Transaction cost" herein refers to bank fees. In many KIKO disputes, firms often argue that a bank sold the product as if a firm did not need to pay bank fees, emphasizing only the zero-cost, without disclosing that the

option price included bank fees. On the other hand, the banks could not agree with the argument because a bank is a for-profit organization. In general, a bank makes a profit margin of about 0.2% to 0.5% of a contract amount, which is included in the contract. The margin for a bank in KIKO transactions ranged from 0.3% to 0.8%.

3 Case in Korea

From 2006 to early 2008, the Korean won-dollar exchange rate stayed around 900 won to the dollar. However, such a currency rate created losses for export firms who were paid in foreign currency. To avoid such currency loss, firms needed to hedge their currency risks more than ever. Although the basic method of hedging currency risk is the forward contract, the continued downward trend at that time increased the demand by those firms for more attractive hedging methods in order to improve the strike price by raising the swap margin from the negative (-) range. KIKO was actively traded to meet the needs of such firms. KIKO, which is a zero-cost product with no premium payment, can increase the strike price. A stable currency fluctuation at that time brought satisfactory results to companies using KIKO. In fact, because the Korean economy is heavily dependent upon export, many SME's (small and medium enterprises) made KIKO contracts. However, the currency rate rapidly changed when the financial crisis began in the U.S. at the end of 2007. In early 2008 the won-dollar exchange rates started going up and ultimately jumped from 1,000 won to 1,500 won in a couple of months. Accordingly, many companies that had KIKO contracts were put into a position of possible bankruptcy. In the end, they initiated lawsuits against the banks that sold KIKO and thus began the KIKO disputes in Korea.

The courts accepted the application of revocation and disposition of KIKO submitted by the firms in the early lawsuits. These courts supported the revocation based on the fact that the currency fluctuations were greater than expected when compared to the exchange rate when the KIKO contracts were made. This brought incredibility strong resistance from the financial industry as the decision shook the foundations of the financial markets, where all transactions are made based upon uncertainty. The banks appealed the decision, and the KIKO dispute escalated into what became a prolonged war.

While the legal dispute between firms and banks continued, Dorco called Robert F. Engle, (a chair professor at the NYU Stern School of Business), as a witness in the trial against Woori Bank and the Foreign Exchange

Bank in the Seoul Central District Court on December 2009. Professor Engle stated that KIKO is designed to be unfair to a bank because the expected profit of a bank is on average about 4.6 times higher than that of most companies and because a firm's maximum loss can be 100 times greater than a bank's loss, based on his analysis of KIKO with the Heston Model. In other words, he stated that the KIKO contract was unfair and that a company's loss increases twice as fast as a bank's loss with an increase in exchange rates. After that, the banks called Stephen A. Ross, (professor of MIT Sloan School of Business), as a witness for refutation. He argued that Professor Engle's logic ignored the fact that firms possess currency assets (dollars) and showed a lack of understanding about the basis of hedging. In addition, he criticized the analysis by Professor Engle regarding expected profit, saying that it was not appropriate to estimate option price arbitrarily by setting market volatility at 70%, which was the level at the time of the IMF financial crisis, rather than the 4% to 5% which applied at the time of contracting. Therefore, Professor Ross argued, KIKO was a proper currency-hedging product for export firms as it was designed to adjust to various conditions, advantageous and disadvantageous, to firms at the stable and downward currency trend of the time.

Likewise, other disputes between firms and banks regarding KIKO continued from 2008 through to 2010. In the above-mentioned lawsuit between Dorco and the two banks, the court made a judgment in favor of the banks, as it agreed with the argument that KIKO was a fair currency option product. After that decision, firms could no longer sue against the unfairness of KIKO. Instead, companies instituted fraud charges against bank CEOs and managers, arguing that they made contracts with the companies with no reference to the costs involved with KIKO.

The court passed sentence on all 91 lawsuits at the end of November, 2010, and ruled partially in favor of 19 firms out of 118, and against the rest. Although appeals continued after the decisions, the fact that the majority of decisions were in favor of the banks concluded the KIKO disputes in Korea for the time being.

4 Implications of the KIKO Cases

In the previous sections, through KIKO dispute cases in Korea, we investigated the various features financial derivatives have, and the kind of side effects which can be brought to the national level by the lack of understanding of those financial derivatives. The KIKO case study pro-

vides meaningful indications of how each economic subject should make an effort for quantitative and qualitative development of the financial derivatives market in the future.

First of all, the government plays an important role. As the financial market develops and financial products become more sophisticated, government needs to put in place a legal system to protect investors, who have relatively little information about such products in the rapidly-changing financial market. However, over-protection of investors should be restricted as well. When many of the companies that made KIKO contracts in Korea were in trouble due to the soaring currency rate, the Korean government funded 6.2 trillion won (as of August 2010) through its Fast Track Program (FTP) to help those companies experiencing a liquidity crisis. Although government should take steps to prevent domestic companies from going bankrupt, over-protection will impede the development of both Korean companies and Korean capital markets in the future. Furthermore, excessive investor protection will restrict speculators and arbitrageurs from investing in Korea, which could result in a lack of liquidity in the financial markets.

Second, financial institutions should take responsibility for investors. Banks used to be brokers of derivatives when the derivatives market was less-developed than at present. However, as they have now instead become dealers, it is necessary to protect those firms which may be relatively disadvantaged by their poor understanding of financial transactions. In particular, government regulations should reduce the negative impact of bank practices of selling other financial products to SME's that are less able to negotiate prices because they have received loans in the past from those banks. Nevertheless, banks should voluntarily, rather than through regulation, try to protect investors and consumers both. For long-term growth, banks need to obtain good customers, and as many as possible, in order to realize higher profits, as a consequence of which the financial markets themselves will continue to grow.

Finally, it is necessary for investors and firms to realize that being informed is the most important ingredient in the financial derivatives market. In the KIKO disputes in Korea, the key point was not whether the purpose of the firms making KIKO contracts was hedging or speculation, but whether those firms should take responsibility for the choices they made. If they targeted hedging, they had to give it full consideration before entering into a contract. Whereas, if the contract was for speculation, it was also obvious that those firms must take responsibility if there is any loss as a consequence of that decision.

As the financial market has continued to change significantly over the past few decades, firms must calculate their risks using many varied scenarios, rather than expecting to be informed of all possible risks by a bank when it comes to financial derivatives transactions. SME's, especially, have to build their own internal risk-management capabilities through the use of professional financial expertise in the rapidly-changing capital market. Firms should put every effort into reducing losses that can be caused by such future transactions by gaining an understanding of the rational and legal foundations of responsibility.

Many developing countries have achieved and are achieving significant developments in the financial derivatives market, compared to past years. However, many cases, including KIKO in Korea and Target Redemption Note (TARN) in Brazil, demonstrate that the financial derivatives market is still in a transition period. To overcome difficulties at this stage and to achieve financial development at the national level, all economic segments, including government, financial firms and investors should put their cumulative learning experience from the past towards making changes for the future.

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