RUTTER ASSOCIATES LLC

Demystifying Exotic Derivatives: What You Need to Know

Rutter Associates

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Abstract

"Exotic" or "complex" derivatives are distinguished from their "plain vanilla" cousins only by the amount of reverse engineering required to value them and to analyze their risk/return trade-offs. Rutter Associates takes the mystery out of these instruments by plotting profit and loss profiles and simulating return distributions.

Using Accumulators, Autocallables, KIKOs and TARNs as representatives of exotic derivatives commonly cited in the financial press, we present key information market participants need to assess in order to understand the derivative trades they are considering.

INTRODUCTION

Derivative market participants engage in two broad activities: 1) hedging away unwanted risk exposures and 2) taking on new risk exposures or amplifying existing ones. The latter activity, often characterized as "speculation", encompasses outright position taking, income generation (for example, covered call writing), and the creation of synthetic investment assets in replication strategies. For purposes of this note, we will define incremental risk mitigation as "hedging" and incremental risk acceptance as "investing". Some participants are hedgers, some are investors and some engage in both hedging away unwanted risks and taking on risks in which they are comfortable investing. The first lesson Professor John Hull offers in his popular textbook "Options, Futures and Other Derivatives" to derivative end-users (primarily nonfinancial corporations but also including family offices and high net worth individuals) is, "make sure you fully understand the trades you are doing"[1]. Derivative end-users have goals and face risks to the achievement of those goals: hedgers aim to use derivatives to reduce risk, and retain the risk of hedge ineffectiveness; investors use derivatives to accept risk in the pursuit of investment gain. Both hedgers and investors need the ability to price the derivatives they transact and to understand the risk/reward trade-offs they face throughout the life of their contracts.

Many of the derivatives contracted by small to mid-sized nonfinancial corporate and high net worth retail end-users are of an "exotic" or "complex" nature that we discuss in our March News and Insights white paper, "Calculating Derivative Complexity". There we define "complexity" as relating to the costs incurred in the modeling effort and data acquisition required to perform an adequate analysis of ex-ante derivative risk/return profiles and valuation and risk management throughout the derivative's life. We also cite four derivative structures that are commonly classified as "exotic" or "complex" in the literature: Accumulators, Autocallables, KIKOs and TARNs[2].

Derivative end-users (both hedgers and investors) often choose to turn to independent and objective third parties (who are not compensated via sales commissions) in order to understand how well exotic and plain vanilla derivatives are suited to achieving their goals, to understand fully the market risks entailed in positions in the contracts, and to obtain independent price verification. In this note, we present Rutter Associates' approach to evaluating the stand-alone market risks and the potential to achieve risky return goals of each of the four complex derivatives cited above. The first two examples are equity-linked derivatives, and the next two examples are foreign exchange-linked ("FX"-linked) derivatives. Each presents counterparty credit risk that is beyond the scope of this note, and we do not consider the potential hedge applications of these derivatives (an end-user contemplating the use of any of these four in a hedge application would need to model the risk/return profile of the underlying account being hedged simultaneously with the derivative contract for a proper hedge evaluation). Thus, the "end-user" in each of the following examples is an investor and the return profiles are those of the particular derivative in isolation and not part of a hedged portfolio. This allows us to focus exclusively on the derivative contract being analyzed.

1 FORWARD ACCUMULATOR

1.1 How This Product Works

A Forward Accumulator allows an end-user to accumulate a predefined number of shares of a single stock over a number of observation periods at a predefined price (the "Forward Price" or alternatively, the "Strike Price"). The Forward Price is generally set 10% - 15% below the spot price at inception.

Accumulators commonly span 1 to 2 years, divided into a number of periods containing roughly the same number of days, ranging from 10 days up to 30 days.

During each period, the referenced stock's close price on each business day is observed to determine the number of shares to be accumulated. If the stock price is above the Forward Price, the end-user accumulates a predefined number of shares. However, if the stock price is below the Forward Price, the end-user accumulates the predefined number of shares multiplied by a leverage ratio. At the end of each

[1]Hull, John. Options, Futures and Other Derivatives. 6th ed. Upper Saddle River, NJ: Prentice Hall, 2006. p.737.

[2]Hughes, Jennifer. "How South Korea is hurting European shares and the HK dollar", Financial Times, Markets Insights, February 4, 2016, http://on.ft.com/1QHdUAR

period, the accumulated shares will be delivered to the end-user in bulk. In exchange, the end-user will pay the dealer the Forward Price multiplied by the accumulated shares in that period.

All Accumulators come with a knock-out feature, which means that if the referenced stock's price is above a predefined level (the "Knock-Out Level"), the contract terminates immediately.

A guarantee period is usually set for the first two observation periods. This means that if the Knock-Out Level is reached during the guarantee period, the contract will terminate after the guarantee period is over, guaranteeing some return to the end-user even if a knock-out event occurs in the days immediately following contract inception.

1.2 Example of an Accumulator

This Accumulator example is a one-year transaction consisting of twenty-six 14-day periods.

The referenced stock is the "XYZ" traded on Hong Kong Exchange.

Stock price at inception is HKD 168.30, Forward Price is HKD 134.401 and Knock-Out Level is HKD 173.834.

The daily number of shares to be accumulated is 1400, with a leverage ratio of 2 times (i.e., if the stock price is below the Forward Price, 2800 shares will be accumulated.)

1.3 Profit and Loss Profile

Figure 1 shows the profit and loss profile for the end-user of this Accumulator on a daily basis[3], assuming no prior knock-out event.

1.4 Probabilities of Gain and Loss

Figure 2 shows Rutter Associates' simulation results, at inception and based on market-implied pricing (this includes interest rate term structure, implied volatilities, etc.), to determine the probabilities of the end-user's present value of profit and loss over the life of the trade.

The results of this simulation demonstrate that the end-user might expect to earn a profit with 87.17% probability (earn 0 to HKD 1 million in 69.92% of the simulations; earn HKD 1 to 2 million in 12.88% of the simulations, and earn more than HKD 2 million up to HKD 6.3 million in 4.37% of the simulations) and to suffer a loss with 12.82% probability. These probabilities are consistent with the Forward Price being below the spot price at inception. It also illustrates both the probabilities of gains and losses for the end-user and the magnitude of these gains and losses. Averaging the results of each individual simulation provides an inception value for this trade.

1.5 Risk Associated with the Structure

The parties to this transaction agreed to terms whereby the end-user is likely to come out ahead. In return, the end-user accepts the risk of a greater downside in the event of an adverse outcome.

The two-to-one leverage inherent in this example is one of the features that enables the end-user to have a Forward Price below the current stock price at inception, and thus a greater probability of achieving a profit rather than a loss.

The potential loss to the end-user from the Accumulator is only limited by the fact that the stock price cannot fall below zero. The higher potential loss is balanced by the higher probability of gain.

Rutter Associates' simulation analysis indicates that the end-user is positioned to lose more than HKD 13,846,013 5% of the time and HKD 27,005,386 1% of the time. In other words, in the risk-neutral world of market-implied pricing the 95 percentile Value at Risk ("VaR") is HKD 13,846,013 and the 99 percentile VaR is HKD 27,005,386.

1.6 Recommended Risk Monitoring and Management

Rutter Associates suggests more detailed simulations as illustrated above and stress testing for more precise risk analysis in order to make informed decisions.

[3]This payoff is based on the assumption that the number of shares is delivered on a daily basis, stocks are sold directly to reflect payoff, no liquidity issue is involved and bid-ask spread is zero. Bear in mind that in real contract terms, stocks are not delivered until the last day of each period.

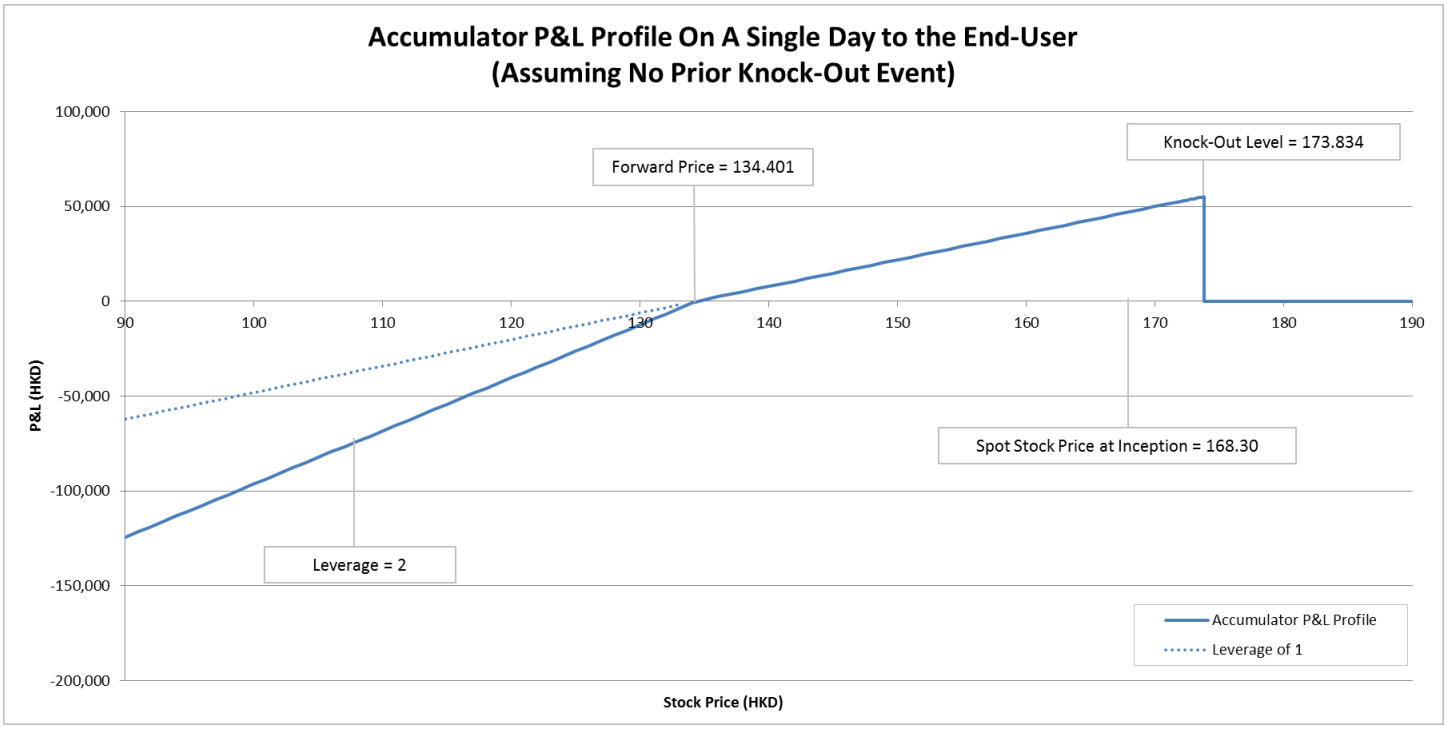

Figure 1

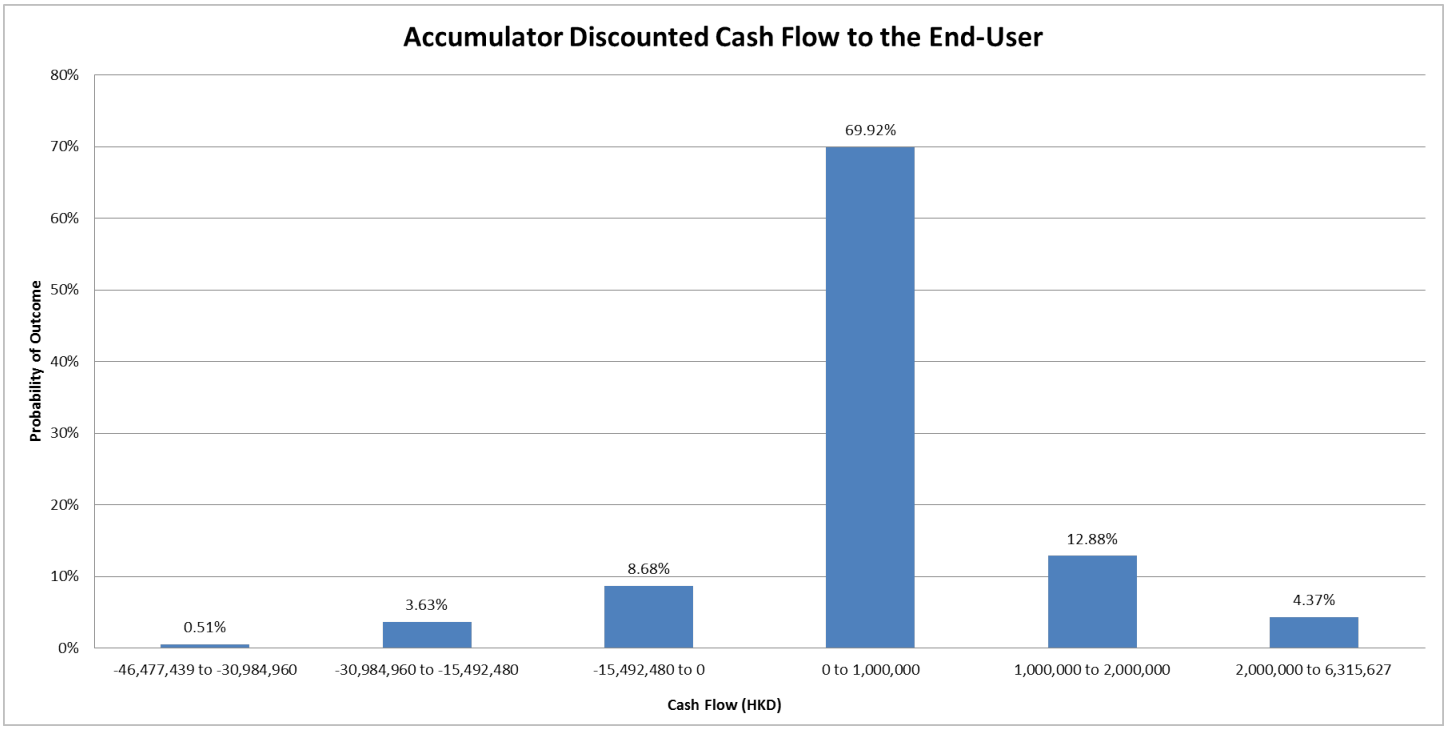

Figure 2

2 AUTOCALLABLE

2.1 How This Product Works

An Autocallable is an equity structured note: at inception, the end-user pays an upfront principal amount for that note. Subsequently, the end-user receives payments linked to the performance of reference stocks or stock indices observed on a series of pre-specified dates (the "Observation Dates") during the life of the note. The prices of the reference stocks (or stock indices) are recorded at inception (the "Initial Levels"). On each Observation Date, the prices of the reference stocks or indices are observed.

If the worst performing of the reference stocks or indices closes at or above its Initial Level at the first or subsequent Observation Dates, the note terminates immediately and the end-user receives 100% of its principal back plus accrued interest. The coupon of an Autocallable is usually significantly higher and therefore generally more attractive than the yield on an alternative fixed income investment with the same credit risk.

If the note does not terminate before the final Observation Date and if the prices of all reference stocks are between their Initial Levels and the predefined lower prices (the "Knock-In Levels"), the end-user of the note receives 100% of its principal back with NO coupon payment. It loses only the time value of its initial cash outlay.

If on the final Observation Date, the price of the worst performing stock (or stock index) is below its Knock-In Level, the end-user receives only part of its principal back, i.e., it suffers the full percentage loss from the Initial Level of the worst performing stock or index.

2.2 Example of an Autocallable

Let's examine an Autocallable with principal amount of USD 1,000,000 and a coupon of 11% per annum.

The note is linked to the "worst of" performance of two referenced stock indices, ABC index and XYZ index. Their Initial Levels and Knock-In Levels are listed below in Table 1.

There are 3 annual Observation Dates during the 3-year life of the note. The knock-in event is observed only on the final Observation Date, and the termination event (sometimes called the knock-out event) is observed on all three Observation Dates.

Possible Scenarios:

1. If on the first Observation Date, both the ABC index and the XYZ index are above their Initial Levels (HKD 14000 and EUR 9000 respectively), the note "auto calls" (i.e., terminates) and the end-user receives 100% of its principal plus 11% accrued interest (11% p.a. coupon for 1 year).

2. If the note does not "auto call" on the first Observation Date and on the second Observation Date both the ABC index and the XYZ index are above their Initial Levels (HKD 14000 and EUR 9000 respectively), the note "auto calls" and the end-user receives 100% of its principal plus 22% accrued interest (11% p.a. coupon for 2 years)

3. If the note has not previously "auto called" and on the final Observation Date both the ABC index and the XYZ index are above their Initial Levels (HKD 14000 and EUR 9000 respectively), the note terminates and the end-user receives 100% of its principal plus 33% accrued interest (11% p.a. coupon for 3 years).

4. If the note has not been "auto called" before the final Observation Date and both indices are between their Knock-In levels and Initial Levels, i.e., ABC index is between HKD 8400 to HKD 14000 and XYZ index is between EUR 5400 and EUR 9000 on the final Observation Date, the end-user receives 100% of its principal but no coupon. The end-user's loss is limited to the time value of its initial cash outlay (i.e., interest foregone) over three years.

5. If on the final Observation Date, the worst performing index, say ABC index, is at HKD 8000, i.e., ABC index is at 57.14% ($\frac{8000}{14000}$) of its Initial Level or has suffered a 42.86% loss from its Initial Level ($\frac{14000-8000}{14000}$), the end-user receives only 57.14% of its principal back. That is, the end-user suffers a 42.86% loss of its initial cash outlay plus the value of foregone interest.

2.3 Profit and Loss Profile

Figure 3 shows the profit and loss profile for the end-user who purchases the Autocallable described

above, assuming no prior knock-out event.

Although the Autocallable is not commonly labeled as an option transaction, the end-user is, in effect, selling a knock-in put option on the shares of the **worst performing** of the ABC index and XYZ index with the option strike prices at HKD 14000 and EUR 9000, respectively, and the Knock-In Level at HKD 8400 and EUR 5400, respectively. By selling this put option, the end-user earns an attractive coupon that is higher than coupons of alternative fixed income investments with the same credit risk.

2.4 Probabilities of Gain and Loss

Figure 4 shows Rutter Associates' simulation results, at inception and based on market-implied pricing, to determine the probabilities of the end-user's present value of profit and loss over the life of the trade.

The results of this simulation demonstrate that the Autocallable end-user might expect to earn a profit with 38.84% probability (terminate at year 1 and earn 11% coupon, a discounted value of USD 104,305, in 25.66% of the cases; terminate at year 2 and earn 22% coupon, a discounted value of USD 197,187, in 8.71% of the cases; terminate at year 3 and earn 33% coupon, a discounted value of USD 278,666, in 4.47% of the cases) and to suffer a loss with 61.16% probability. In 34.38% of our simulations, the end-user receives initial principal cash outlay back and loses only the time value of money, i.e., a loss of USD 38,597; in 26.78% of our simulations the end-user loses more than USD 400,000 or a minimum of 40% of the end-user's initial cash outlay. Figure 4 illustrates both the probabilities of gains and losses for the end-user and the magnitude of these gains and losses. Averaging the results of each individual simulation provides an inception value for this trade.

2.5 Risk Associated with the Structure

The end-user earns an attractive coupon that is higher than coupons of alternative fixed income investments with the same credit risk in return for accepting the risk of a greater downside in the event of an adverse outcome (i.e., in return for writing the knock-in put option discussed above).

Because of the "worst of" performance payoff, the correlation between the two reference stock indices is an important factor in the analysis of the structure. All else equal, the lower the correlation, the worse for the end-user. This is because a lower correlation leads to a higher dispersion of returns on the reference indices, i.e., a higher possibility that the two indices move in different directions. And since the end-user will lose money in the event that **any one** of the index prices drops below its Knock-In Level, a lower correlation increases the probability of this event.

Note also that in the Autocallable, the end-user transfers its FX risks to the dealer, thus the dealer will need to "charge" or price that accommodation into the trade via a factor known as a "quanto adjustment".

Rutter Associates' simulation analysis indicates that the end-user is positioned to lose more than USD 625,479 5% of the time and USD 714,385 1% of the time. In other words, in the risk-neutral world of market-implied pricing the 95 percentile VaR is USD 625,479 and the 99 percentile VaR is USD 714,385.

2.6 Recommended Risk Monitoring and Management

Rutter Associates suggests more detailed simulations as illustrated above and stress testing for more precise risk analysis in order to make informed decisions.

Reference Stocks	Initial Levels	Knock-In Levels
ABC index	HKD 14000	HKD 8400 (60% of Initial Level)
XYZ index	EUR 9000	EUR 5400 (60% of Initial Level)

Table 1: Details of Autocallable

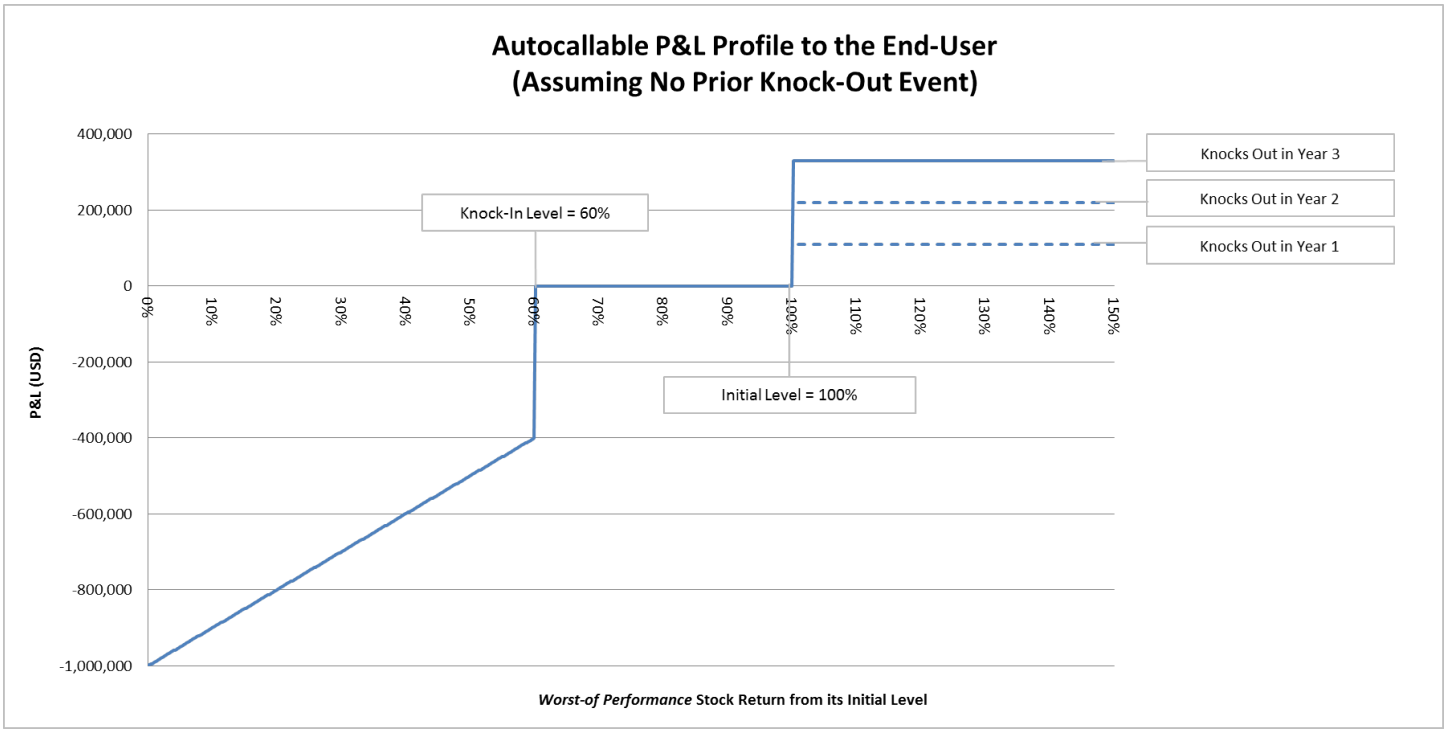

Figure 3

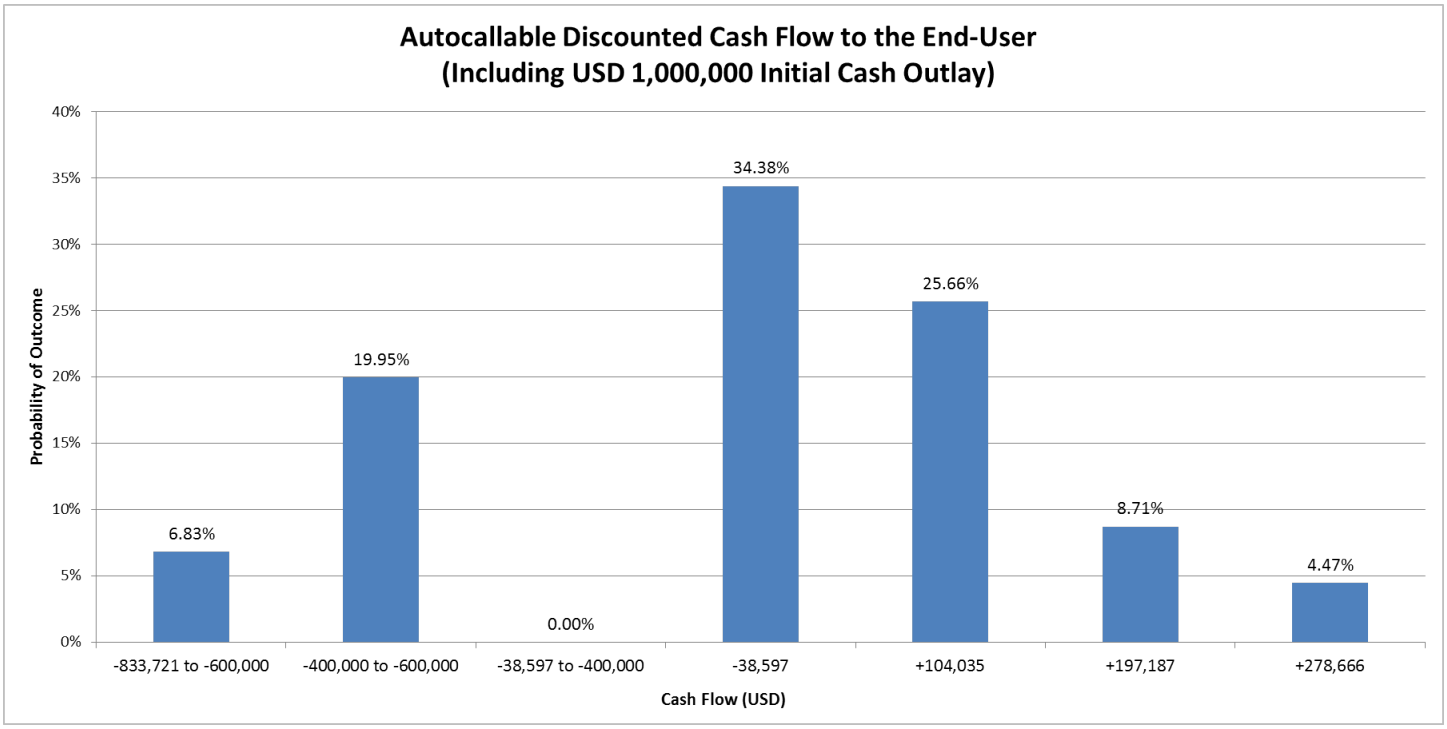

Figure 4

3 KIKO

3.1 How This Product Works

"KIKO" is an acronym for "knock-in & knock-out", and a FX KIKO refers to an exotic FX derivative trade in which the end-user buys a strip of put options and sells a strip of call options of notional amount typically twice that of the purchased puts. The strip of put options knocks out once a certain exchange rate (the "Knock-Out Level") is reached terminating the trade and limiting gains to the end-user; the call options knock out at the same Knock-Out Level and knock in at a certain FX level (the "Knock-In Level") beyond which losses to the end-user are not limited by any boundaries other than the near-absurd event of a zero currency value. Because the notional amount of the strip of calls is twice that of the puts (this is commonly referred to as "leverage" or "gearing") losses can accrue at twice the rate of gains. While gearing is typically two times, it can certainly be higher or lower.

In practice, one of the most popular KIKO structures has the end-user purchasing a strip of in-the-money puts from a dealer and writing a strip of twice as many out-of-the money calls to the dealer with appropriately set gearing and Knock-In and Knock-Out Levels such that the initial outlay from the end-user of this structure is zero.

3.2 Example of a KIKO

An end-user buys a series of puts on the US Dollar ("USD") (or equivalently calls on the Korean Won ("KRW")) while selling a series of calls on the USD (equivalently puts on the KRW). The contract has 3-year maturity and monthly settlement (i.e., it embeds a strip of 36 calls and 36 puts). The notional amount of the purchased puts is set at USD 1 for illustrative purposes, and the notional amount on the calls is set at USD 2 to reflect the gearing. In both purchasing puts on USD and selling calls on USD, the end-user is betting against the dollar's appreciation.

The Knock-In/Knock-Out Levels, option strike price for both calls and puts (the "Strike Price"), the spot FX rate at inception together with key KIKO pricing inputs are summarized in Table 2.

3.3 Profit and Loss Profile

Figure 5 shows the profit and loss profile for the first put-call combination of the strip of 36.

If on any monthly Settlement Date, the US dollar trades below 1000 KRW/USD and above 900 KRW/USD, assuming no prior knock-out event, the end-user will choose to sell dollars to the dealer for 1000 KRW/USD (in the illustration below, the end-user will profit from buying dollars for 950 KRW/USD and selling them to the dealer for 1000 KRW/USD). In this case, the end-user wins and the dealer loses.

If on any monthly Settlement Date, the dollar trades below 900 KRW/USD, then the trade knocks out, i.e., the whole contract terminates.

Assuming no prior knock-out event, if, on any monthly Settlement Date, the dollar trades above 1200 KRW/USD, all the call options knock in, meaning that the dealer may choose to buy dollars from the end-user for 1000 KRW/USD and subsequently sell the dollars for more than 1200 KRW/USD. And once all the call options knock in, the dealer will profit as long as the dollar trades above 1000 KRW/USD. In this case the dealer wins and the end-user loses. Note from the above that when the end-user "loses", it does so at twice the rate at which it "wins". This is the effect of "gearing" or "leverage".

3.4 Probabilities of Gain and Loss

Figure 6 shows Rutter Associates' simulation results for the entire strip of 36 puts and calls, at inception and based on market-implied pricing, to determine the probabilities of various levels of profit and loss.

The results of this simulation demonstrate that the KIKO end-user might expect to earn a profit with 90.75% probability (5.14% probability of a profit up to KRW 500, 49.16% probability of a profit between KRW 500 and KRW 1,000 and 36.45% probability of a profit between KRW 1,000 and KRW 2,314) and to suffer a loss with 9.25% probability (3.80% probability of loss greater than KRW 5,000). Averaging the results of each individual simulation provides an inception value for this trade.

3.5 Risk Associated with the Structure

When analyzed at trade inception, the end-user is likely to record a gain over the life of the KIKO. In return, the end-user accepts the risk of a greater

downside in the less likely event of an adverse outcome.

We can see that the riskiness of the KIKO structure derives from the selling of embedded call options. The skewness of the return distribution arises from both the gearing on the written calls and the nature of the KIKO barriers that limit upside potential of the purchased puts but leave downside potential limited only by the near-absurd condition that the KRW becomes entirely worthless.

Rutter Associates' simulation analysis indicates that the end-user is positioned to lose more than KRW 3,959 5% of the time and KRW 8,924 1% of the time. In other words, in the risk-neutral world of market-implied pricing the 95 percentile VaR is KRW 3,959 and the 99 percentile VaR is KRW 8,924.

3.6 Recommended Risk Monitoring and Management

Rutter Associates suggests more detailed simulations as illustrated above and stress testing for more precise risk analysis in order to make informed decisions.

Data	**Values** FX are in KRW/USD unit
Spot FX Rate at Inception	950
Strike Price	1000
Knock-Out Level	900
Knock-In Level	1200
Expiry	3 years
Volatility	7% per year
3yr US Risk Free Rate	5.20%
3yr Korean Risk Free Rate	4.90%
Payment Frequency	Monthly
Notional Amount of Call on USD	KRW 2000 / USD 2
Notional Amount of Put on USD	KRW 1000 / USD 1

Table 2: KIKO details

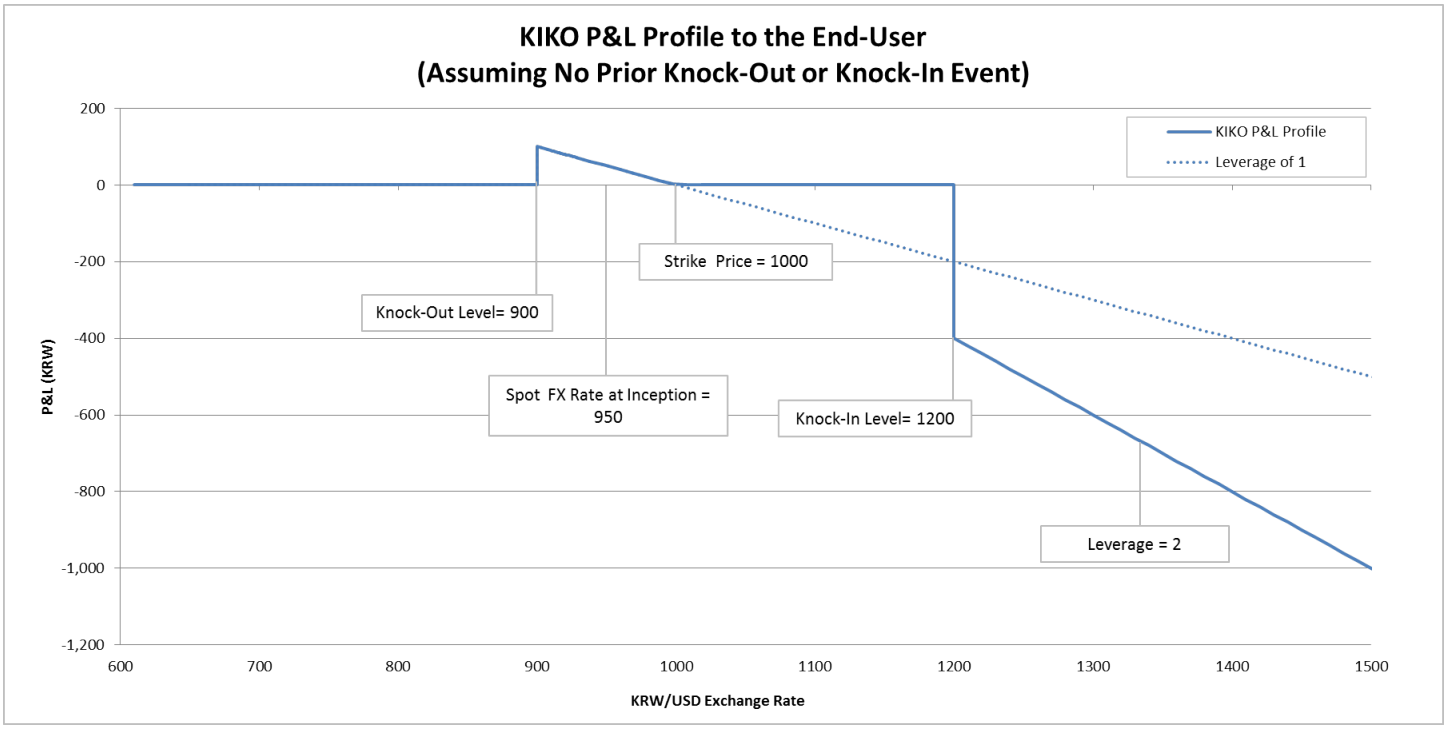

Figure 5

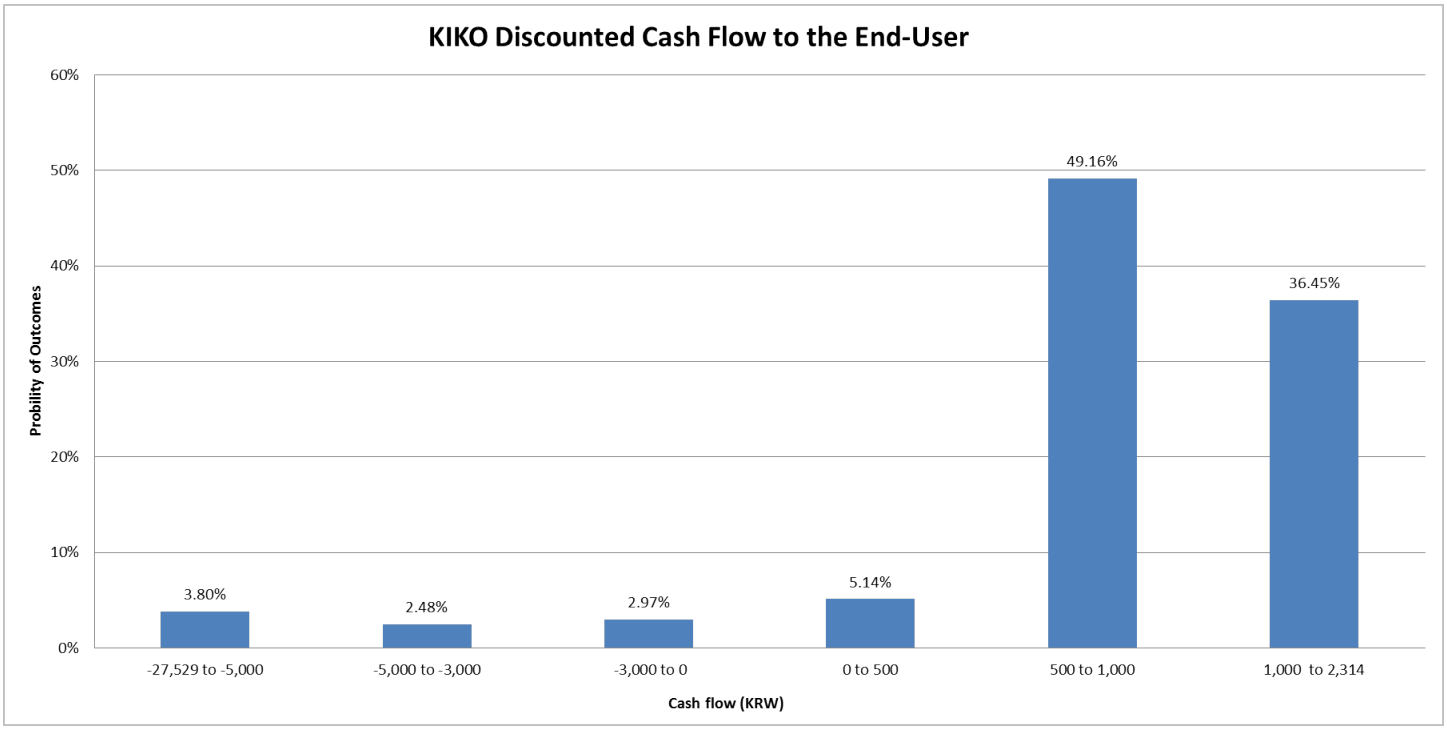

Figure 6

4 TARN (TARGET ACCRUAL REDEMPTION NOTE)

4.1 How This Product Works

Traditionally, the term "TARN" has meant a note that has a "target accrual redemption" amount, meaning that the return to the holder of the note is capped at a specified target amount. The term "TARN" has come to mean any transaction, whether in the form of a note or an unfunded derivative contract, in which the return to one of the parties is capped at a specified target amount.

In a FX TARN, the end-user and the dealer exchange specified currencies, based on a predetermined exchange rate level (the "Forward Price" or alternatively, the "Strike Price") on a series of prespecified dates (the "Settlement Dates") during the life of the transaction. Unlike a regular FX forward contract, the FX TARN usually has different currency amounts to be exchanged when the FX rate is above or below the Forward Price.

Although a TARN is not commonly labeled as an option transaction, the end-user is, in effect, buying a strip of call options and selling a strip of put options of notional typically twice that of the purchased calls. In addition to the target redemption termination provision, a TARN can also have a knock-out provision saying that if the level of the FX rate is over a predetermined price (the "Knock-Out Level") the TARN terminates.

4.2 Example of a TARN

This TARN example is composed of 26 bi-weekly Settlement Dates over a one year tenor. The spot FX rate at inception is 102 JPY/AUD.

On each Settlement Date

1. If the FX rate is equal to or greater than 97 JPY/AUD, the end-user receives AUD 2,000,000 and pays JPY 194,000,000, i.e., the end-user buys AUD 2,000,000 at the Forward Price of 97 JPY/AUD and the end-user has a profit of JPY 2,000,000 $\times$ (FX rate-97) (the "Profit Amount").

2. If the FX rate is in between 97 JPY/AUD and 90 JPY/AUD, no payments occur.

3. If the FX rate is equal to or less than 90 JPY/AUD, the end-user receives AUD 4,000,000 and pays JPY 388,000,000, i.e., the end-user buys AUD 4,000,000 at the Forward Price of 97 JPY/AUD and the end-user has a loss of JPY 4,000,000 $\times$ (97-FX rate).

If the exchange rate moves to or above the Knock-Out Level of 105 JPY/AUD on any Settlement Date, the TARN transaction terminates immediately.

If the aggregate Profit Amount to the end-user reaches or exceeds JPY 68,000,000 on any Settlement Date, the end-user only receives, on that date, a JPY amount such that the aggregate Profit Amount equals JPY 68,000,000, and the TARN transaction terminates immediately.

The end-user received an upfront payment of JPY 41,000,000 at inception.

The payoff schedule above is, in effect, that of the end-user buying a strip of call options on AUD with notional amount of AUD 2,000,000 and selling a strip of put options on AUD with notional amount twice that of the purchased calls. The call options have a Strike Price at 97 JPY/AUD and the Knock-Out Level at 105 JPY/AUD. The put options have the same Strike Price and Knock-Out Level with Knock-In Level at 90 JPY/AUD.

4.3 Profit and Loss Profile

Figure 7 illustrates the profit and loss profile for the end-user on a Settlement Date, assuming there is no knock-out or the accrual target is not reached prior to this Settlement Date.

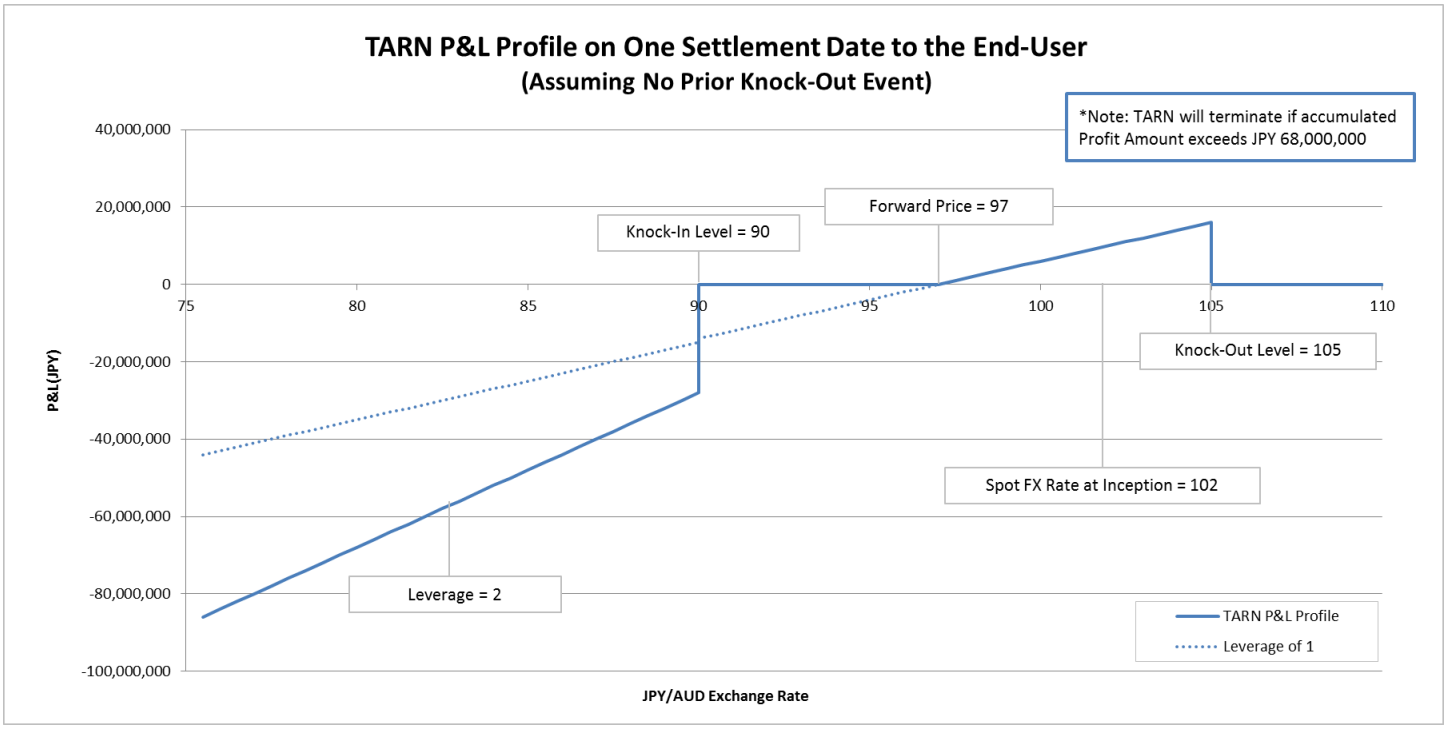

Figure 7

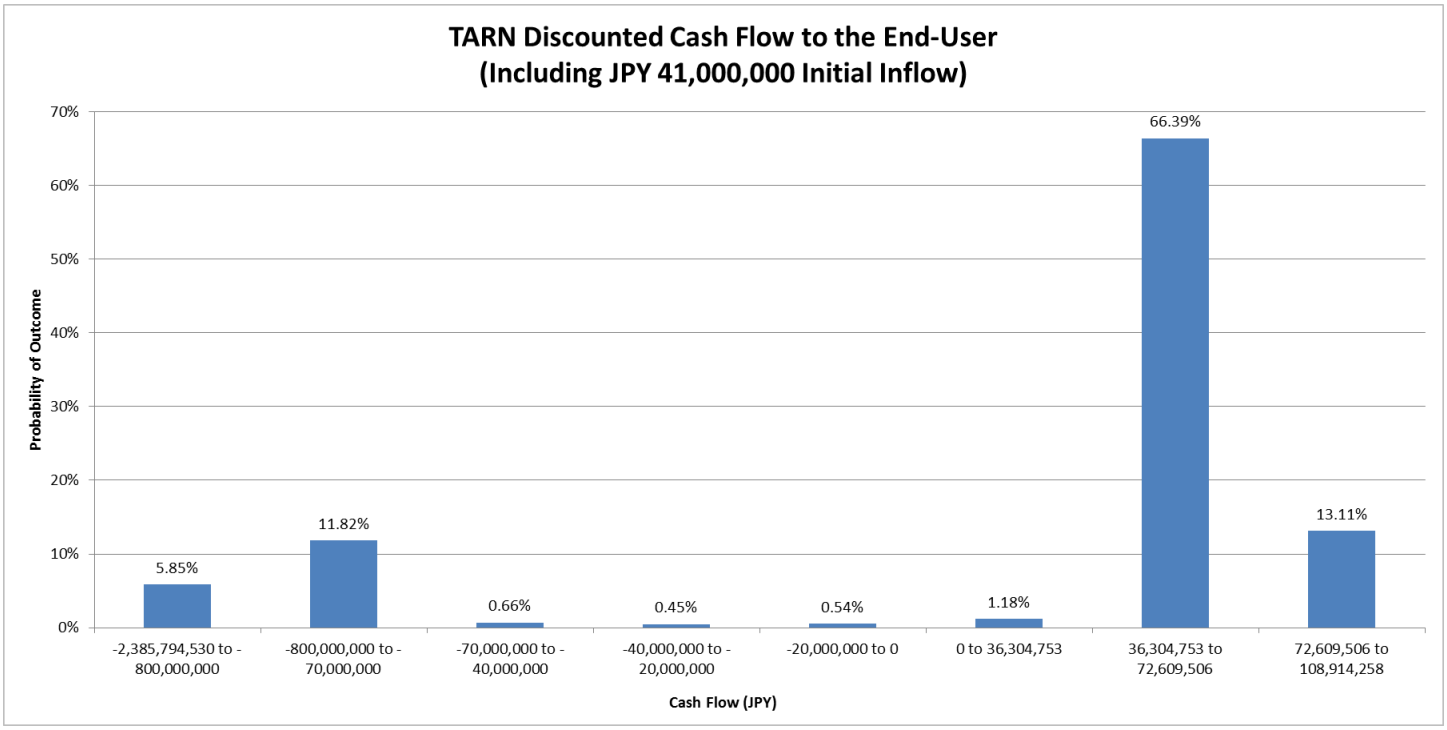

Figure 8

4.4 Probabilities of Gains and Losses

Figure 8 shows Rutter Associates' simulation results, at inception and based on market-implied pricing, to determine the probabilities of the end-user's present value of profit and loss over the life of the trade.

The results of this simulation demonstrate that the end-user might expect to earn a profit of up to JPY 108.91mm with probability 80.68% and to suffer a loss of up to JPY 2,385.79mm with probability 19.32% (the expected loss, given that there is a loss, is JPY 597.18mm). These probabilities are consistent with the Forward Price being below the spot FX rate at inception. Figure 8 above illustrates both the probabilities of gains and losses for the end-user and the magnitude of these gains and losses. Averaging the results of each individual simulation provides an inception value for this trade.

4.5 Risk Associated with the Structure

At inception of the trade, the dealer agrees to terms whereby the end-user is likely to come out ahead. In return, the end-user accepts the risk of a greater downside in the event of an adverse outcome.

The two-to-one notional amount leverage inherent in this TARN example is one of the features that enables the end-user to achieve a Forward Price that is below the spot JPY/AUD exchange rate at inception and to set the Knock-In Level at a level that is well below the spot JPY/AUD exchange rate. As a result, the leverage is a factor in the probability of a gain for the end-user being greater than the probability of a loss.

The potential loss to the end-user from the TARN transaction is only limited by the fact that the JPY/AUD exchange rate cannot fall below zero. The higher potential loss is balanced by the higher probability of gain.

Rutter Associates' simulation analysis indicates that the end-user is positioned to lose more than JPY 865,110,450 5% of the time and JPY 1,395,871,276 1% of the time. In other words, in the risk-neutral world of market-implied pricing the 95 percentile VaR is JPY 865,110,450 and the 99 percentile VaR is JPY 1,395,871,276.

4.6 Recommended Risk Monitoring and Management

Rutter Associates suggests more detailed simulations as illustrated above and stress testing for more precise risk analysis in order to make informed decisions.

5 Conclusion

Professor Hull's advice, "make sure you fully understand the trades you are doing"[4], cannot be overemphasized.

For complex or exotic derivatives, the end-user (whether hedging risk away or accepting risk in the pursuit of investment gains) must fully understand the trade and the rationale for entering into it. Further, he or she should be able to explain it to senior management and external stakeholders and not rely on the derivatives dealer for this.

The end-user must also be able to value the derivative and to assess the incremental risks associated with the derivative. The end-user must not rely on the derivatives dealer for valuation and risk assessment.

If the end-user does not have in-house capability in risk assessment and valuation, he or she should engage external resources.

The four instruments examined in this note represent complicated trades for which risk/return analysis and valuation may present daunting challenges to some end-users. The Accumulator trade, perhaps the least complicated of the four, straddles the green and yellow zones of Rutter Associates' Complexity Calculator when applied to the modeling expertise of our own quantitative analysts in Figure 9.

For firms and individuals without such in-house capability, the Complexity Calculator will likely point solidly to the red (inputs to the calculator indicating that the end-user has no models and data for fair value determination and risk assessment, cannot quantify effect of leverage and cannot quantify downside potential) in Figure 10.

For such red-zone situations, a derivative end-user would be wise to seek independent and objective expert assistance.

[4]Hull, John. Options, Futures and Other Derivatives. 6th ed. Upper Saddle River, NJ: Prentice Hall, 2006. p.737.

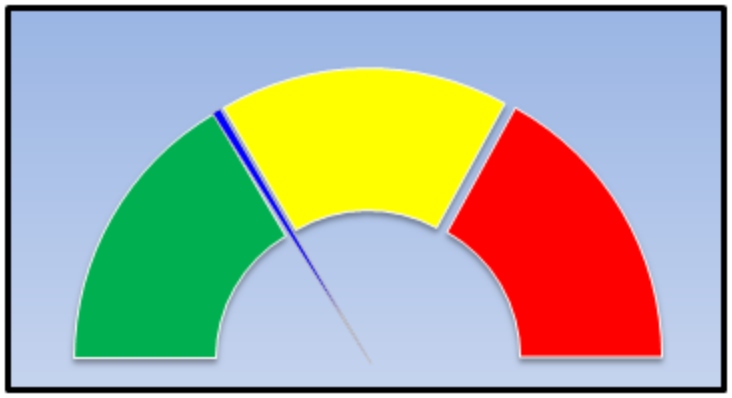

Figure 9

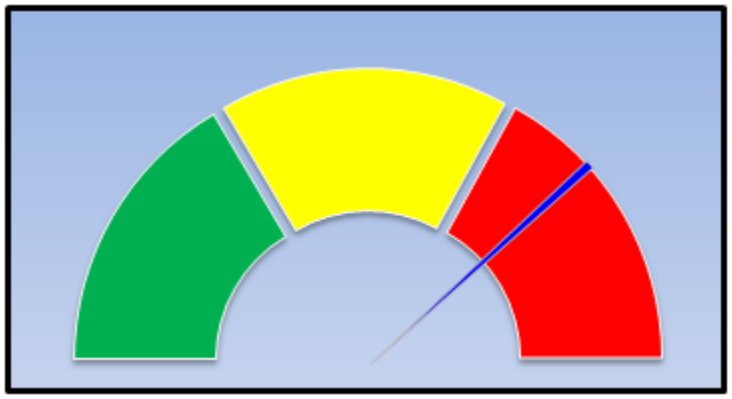

Figure 10