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Risk Reversals

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Risk Reversals

Risk reversal is a commonly used term in the FX markets. Specifically, a risk reversal is:

1. An option strategy combining the simultaneous purchase of out-of-the-money calls (puts) with the sale of out-of-the-money puts (calls). The options will have the same expiration date and similar deltas.
2. A market view on both the underlying currency and implied volatility.

This article:

- Describes the origins of the risk reversal
- Defines the volatility smile and skew
- Examines specific example of quotes
- Investigates a hedging example

Origins of the Risk Reversal

The risk reversal has its underpinnings from the limitations of the Black Scholes Merton (BSM) option pricing model. One of the limitations is that the BSM assumes a normal distribution. Anyone involved in the spot FX markets will tell you that price ranges are anything but normal! In practice, the currency markets follow what is known statistically as leptokurtosis. In laymen's terms, this means that the underlying will trade at extreme prices from the current spot market more frequently than a normal distribution would suggest. The price action at these extreme levels is referred to as "fat tails".

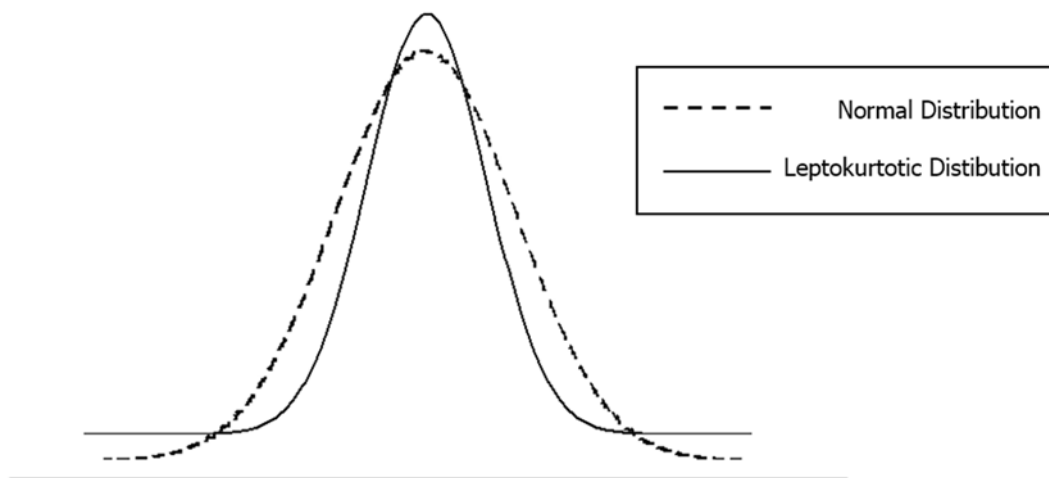


Figure 1: Normal Distribution vs. Leptokurtotic Distribution

Volatility Smile

If more price action occurs at these extreme levels than suggested by the model, the option trader will mark volatility higher to account for the increased probability of the underlying trading in the “fat tails”. The end result is that implied volatility will be higher for out-of-the-money (OTM) and in-the-money (ITM) options than at-the-money (ATM) options. If there is no bias in market expectations of the underlying price, then the picture of volatility is symmetrical around the at-the-money volatility. This is commonly referred to as the “volatility smile”. Notice in Figure 2 how the volatilities are symmetrical around the ATM forward.

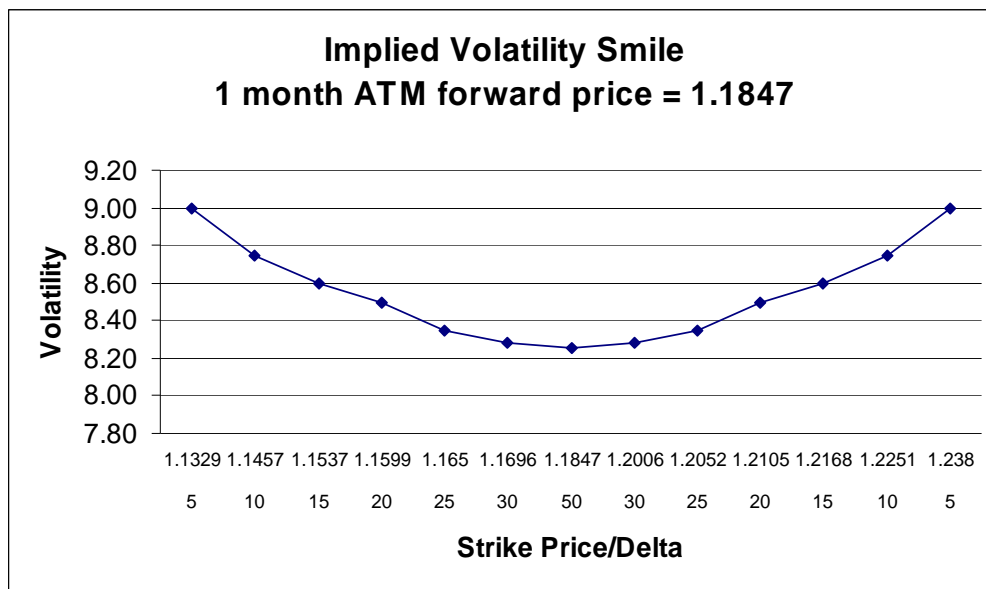


Figure 2: Theoretical Volatility Smile – USD/CAD

Volatility Skew

In practice there are supply and demand considerations along with market expectations built into option prices. This pushes up the volatility for ITM (OTM) calls (puts) relative to those of the puts (calls). This is referred to as the “skew”. The risk reversal expresses the difference in volatility. In theory, if a currency is expected to appreciate, calls would be favored over puts and the purchaser of the call would pay a higher volatility relative to puts.

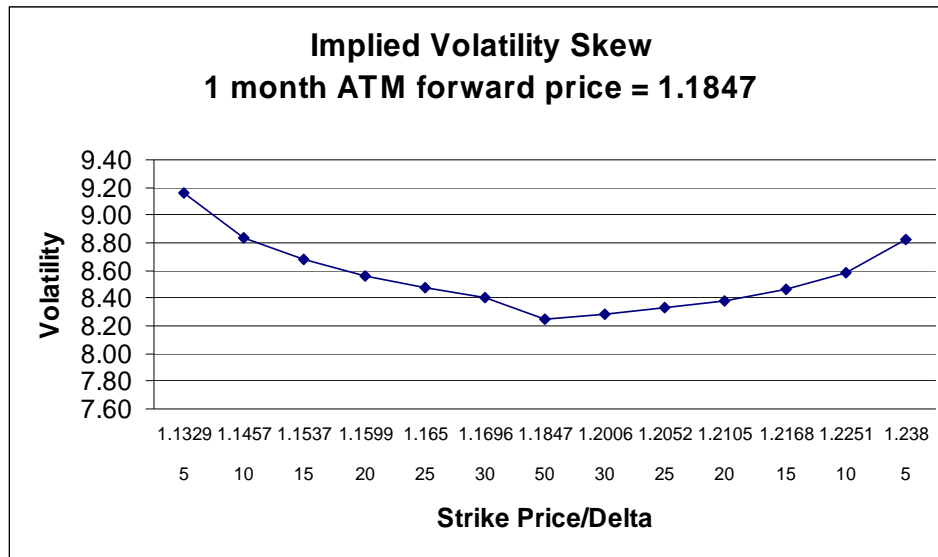


Figure 3: Volatility Skew - USD / CAD Source: Superderivatives

Looking at Figure 3, notice how the volatilities are higher as the CAD is appreciating. The interpretation is that the market expects the CAD to appreciate and/or implied volatility to move higher.

Example

The market has established a 25 (0.25) delta benchmark for risk reversal quotes. For example, assume the market expects the CAD to appreciate against the USD. A trader quotes a 1-month 25 delta USD/CAD risk reversal of .15 -.28% where CAD calls are favored over CAD puts. Based on this information, the trader would be willing to do each of the following, assuming volatility is 8.50%:

1. Buy the 25 delta USD put/CAD call at 8.65% and sell the USD call/CAD put at 8.50%.
The trader pays away the .15%

or

2. Sell the 25 delta USD put/ CAD call at 8.78% and buy the USD call/CAD put at 8.50%.
The trader earns the .28 spread

In essence, the dealer is willing to buy the USD put/CAD call at 8.65% and sell the USD put/CAD call at 8.78%. The dealer is giving a “choice” quote to either sell the USD Call/CAD put or buy the USD call/CAD put at 8.50%.

Hedging Example

Assume a U.S. company is importing goods from Germany and is invoiced in euros. The invoice is EUR 1,000,000 and is due in three months. The company is concerned that the USD will depreciate. Assume current market prices are as follows:

Spot	1.2073
Forward	1.2146
EUR Call 25 Delta Strike/Vols	1.2519 / 9.15%
Premium	USD 800
EUR Put Strike/Vols	1.1779 / 8.95%
Premium	USD 800

To hedge the position, the company buys a EUR call/USD put at 25 delta and sells a corresponding EUR put/USD call.

Figure 4 shows the company's exposure in three months. Assume the current 3-month forward price is 1.2146 and the company could lock in the forward exchange rate at this price. Hence, this will be their benchmark to compare the hedge using the risk reversal.

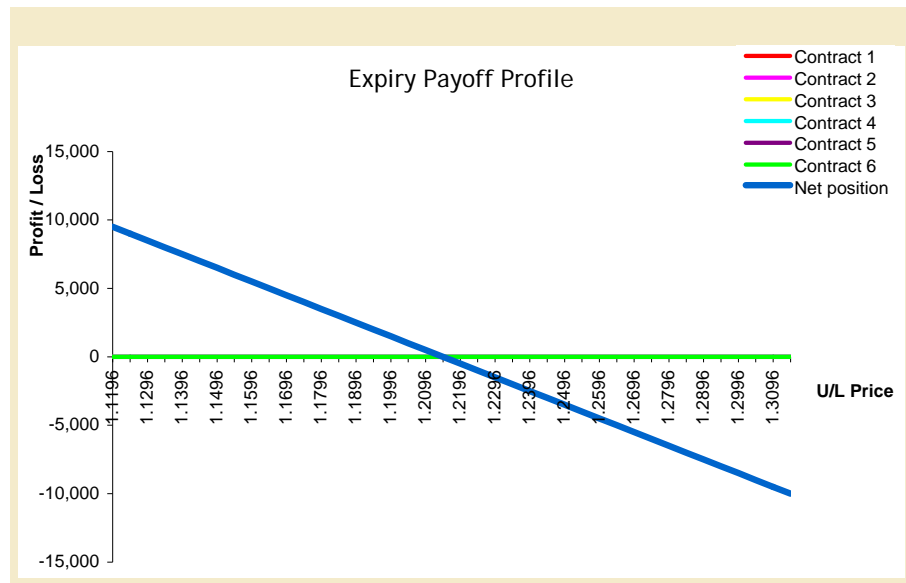


Figure 4: Net Exposure of U.S. Company

Figure 5 shows the risk reversal. Contract 2 is the EUR call / USD put. Contract 3 is the EUR put /USD call. The blue line is the net position of the two contracts

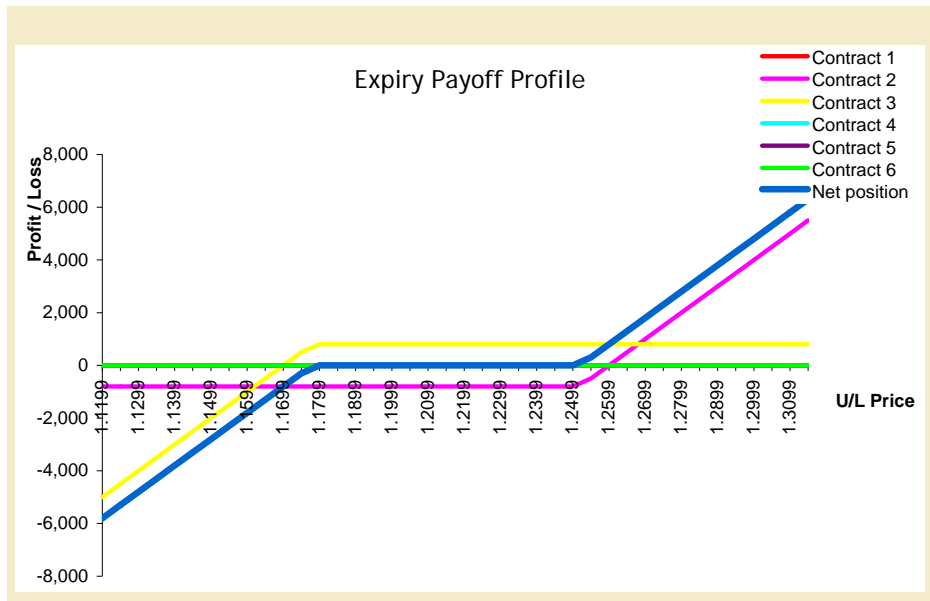


Figure 5: Risk Reversal

Figure 6 combines the two positions resulting in what is commonly referred to as a collared position. Contract 1 is the company's original exposure to the euro. Contract 2 is the EUR call / USD put. Contract 3 is the EUR put / USD call. The blue line is the net position of the three contracts (exposures).

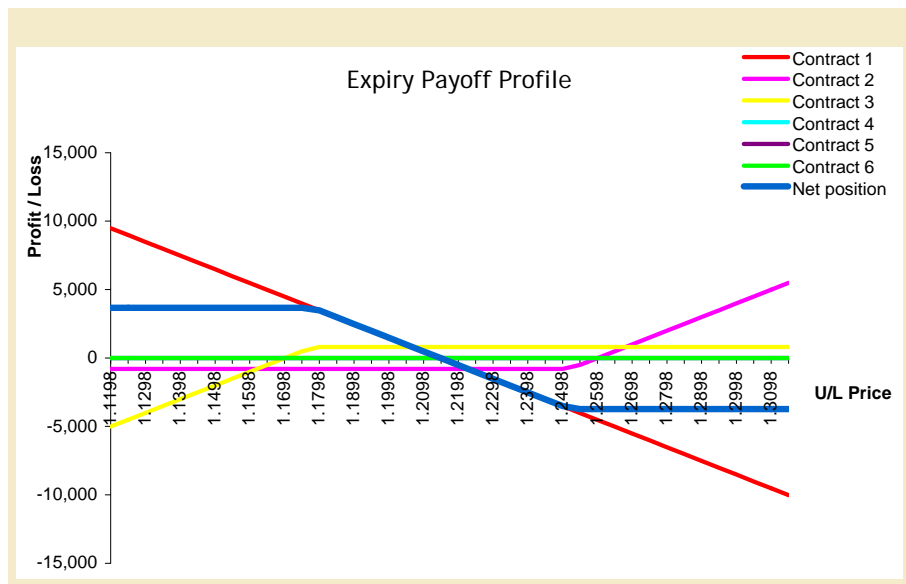


Figure 6: Combined Exposure of U.S. Company with Risk Reversal

It is interesting to note that the company is more concerned with the efficacy of the hedge. The trader, on the other hand, will be more interested in the detailed aspects of the risk reversal including the impact it will have on the option books' risk measurements, i.e. the Greeks.

Summary

This article:

- Described the origins of the risk reversal
- Defined the volatility smile and skew
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Any questions or comments can be addressed to the author at kkapner@gfmi.com

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- Chisholm Roth for using Magellan spreadsheets illustrating the option payoff profiles

About the author

Ken Kapner, CEO and President, started Global Financial Markets Institute, Inc. (GFMI) a NASBA certified financial learning and consulting boutique, in 1998.



Professional Experience

Since 1997, Ken has designed, developed and delivered custom instructor led training courses for a variety of clients including Government Regulators, Asset Managers, Banks and Insurance Companies as well as a variety of support functions for these clients. Ken is well-versed in most aspects of the Capital Markets. His specific areas of expertise include derivative products, risk management, foreign exchange, fixed income, structured finance, and portfolio management.

He has been a Risk Management Advisor to a Mutual Fund's Board of Trustees and has served as an Expert Witness using knowledge of derivatives, trading and risk management

Prior, Ken spent 14 years with the HSBC (Hong Kong and Shanghai Banking Corporation) Group in their Treasury and Capital markets area where he traded a variety of instruments including interest rate derivatives, spot and forward foreign exchange, money markets, managed the balance sheet, sat on the Asset Liability Committee and was responsible for the overall Treasury activities of the bank. He spent two years in Hong Kong where he headed up HSBC's Global Treasury and Capital Markets Product training. Specifically, his responsibilities included developing new courses and delivering courses to traders, support staff and relationship managers. In New York, he established a training department for the firms' Securities Division where he was in charge of the MBA Associates Program, continuing education and Section 20 license. He currently runs his own training and consulting firm called Global Financial Markets Institute (GFMI). He has co-authored/co-edited seven books on derivatives including The Swaps Handbook and Understanding Swaps.

Articles

March 2002 Futures Magazine, Doing Your Homework on Individual Equity Futures (co-written with Robert McDonough)

Books

1996 Como Entender Los Swaps, (co-author: John Marshall), published by CECSA (a Mexican publishing firm). This is a translated edition of our book Understanding Swaps, but with adaptations to fit the Mexican markets. (289 pages)

1993 The Swaps Market: 2nd edition, Kolb Publishing, 288 pages (co-author: John Marshall, copyright 1993). This book is directed to the graduate business student.

1993 Understanding Swaps, John Wiley & Sons, 270 pages (co-author John Marshall, copyright 1993). This book is directed to the practitioner market and is published as part of Wiley's Finance Series.

1993 1993-94 Supplement to the Swaps Handbook, New York Institute of Finance, a Simon & Schuster Company, 494 pages, (co-authors John Marshall and Ellen Lonergan, copyright 1993). This book is directed to a practitioner audience and is a supplement to The Swaps Handbook. My role was largely that of editor.

1991 1991-92 Supplement to The Swaps Handbook, New York Institute of Finance (Simon & Schuster Professional Information Group), 300+ pages (co-author: John Marshall copyright 1992). This book is directed to a professional practitioner audience and is an annual supplement to The Swaps Handbook.

1990 The Swaps Handbook: Swaps and Related Risk Management Instruments, New York: New York Institute of Finance, a Simon & Schuster Company, 543 pages. (co-author: John Marshall). This book is directed to derivative product professionals.

1988 Understanding Swap Finance, Cincinnati: South Western publishing Company, 155 pages. (co-author John Marshall, copyright 1990). This was the first academic text published on the swaps markets.

Affiliations

International Association of Financial Engineers
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