TMX Montréal Exchange

Reference Manual

Currency Options

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The masculine form used in this document includes the feminine where appropriate in the context.

Introduction

The foreign exchange or FX market is one of the most liquid financial markets in the world with an average daily turnover of US$3.2 trillion in 2007 (source: Bank for International Settlement).

The FX market is normally driven by macroeconomic factors and international monetary flows. For example, if there are large sellers of currency A versus currency B, the value of currency A will depreciate with respect to currency B. As in all markets, matching supply and demand fixes the price of currencies, relative to one another. There are also equally large trading flows in the FX market from speculators hoping to profit from a forecast move in a particular exchange rate.

The high liquidity of this market means that a large number of positions can be opened or closed out quickly.

Currency options provide both speculation and hedging strategies to Canadian investors, with the same ease of execution as buying an equity option.

How currencies are quoted in the spot market

It is important for investors to understand the quotation conventions on the foreign exchange market. The way currencies are quoted against each other can initially seem a little confusing.

The quoting convention of ABC/XYZ refers to the number of units of currency XYZ equal to one unit of currency ABC. To figure out which currency to buy or sell, look at how it is denominated. If the denomination is ABC/XYZ, an appreciation of ABC will result in higher quotes, and so a depreciation of XYZ.

There are two rules of thumb.

Rule 1:

Most foreign exchange rate quotes are expressed as units per U.S. dollar. For example, USD/CAD refers to the number of units of Canadian currency equal to one U.S. dollar. In other words, USD/CAD means that the exchange rate represents the value of one U.S. dollar in Canadian dollars.

The technical term for this is that the U.S. dollar is the "base currency" against which the Canadian dollar is quoted. The Canadian dollar is the quoted currency or "terms currency".

Rule 2:

All foreign exchange rate quote denominations are backwards with the base currency stated first, so the quote between the Canadian dollar (CAD) and the U.S. dollar (USD), for example, is denominated as USD/CAD.

How currency options work

Currency options use the same parameters as equity options (call option, put option, strike price, expiration). The major difference is the underlying, which is a foreign currency instead of a stock or an index.

Currency option contracts on the Montréal Exchange are quoted, traded and cleared in Canadian dollars.

- **Underlying currency**
  The underlying currency is the currency which is purchased (for a call option) or sold (for a put option). The Montréal Exchange lists currency option contracts on the U.S. dollar (symbol: USX).

- **Trading unit (contract size)**
  The trading unit for a currency option represents how many units of the underlying currency are controlled by one option contract. The contract size is set for the needs of the widest range of investors. Option contracts on the U.S. dollar (USD/CAD exchange rate) have a trading unit of US$10,000, indicating that the option gives the holder the right to 10,000 units of the U.S. currency.

• **Option premiums**

Currency option premiums are expressed in cents Canadian per unit of foreign currency.

> **Example:**
> If an option contract on the U.S. dollar is purchased at a premium of 0.12 cents Canadian per U.S. dollar, the holder would pay C$12 (0.12 cents Canadian/US$1 x the unit of trading of US$10,000 x C$1/100 cents Canadian).

The minimum tick represents 1/100th of a cent equivalent to C$1 and determined as follows:

$$\frac{\text{0.01 cent Canadian}}{\text{1 unit of foreign currency}} \text{ x the unit of trading 10,000 x } \frac{\text{C\$1}}{\text{100 cents Canadian}}$$

• **Strike prices**

The strike price of a currency option is expressed as the number of units of Canadian currency required for one unit of foreign currency on the expiration date. That is, the strike price is expressed in cents Canadian per unit of foreign currency.

> **Example:**
> A call option on the U.S. dollar with a strike price of 114 cents Canadian would give the option buyer the right to buy U.S. dollars at 114 cents Canadian per U.S. dollar.

• **Trading and settlement**

Currency options on the Montréal Exchange are European-style options that may be exercised only at expiration. Currency options are cash settled. They are priced and traded in Canadian currency, which means that the payout is always a Canadian dollar cash amount, and are automatically exercised at expiration if they are 0.01 cent Canadian or more in-the-money. As such, if held to expiration (third Friday of the contract month), the option holder of a call option (put option) will automatically receive a cash payment if the exchange rate is above (below) the strike price.

> > **Reference rate:** Bank of Canada's noon USD/CAD rate at expiry.

As currency options are cash settled at expiration, investors do not need to worry about delivery procedures of the underlying value.

• **Guarantee**

The Canadian Derivatives Clearing Corporation (CDCC) is the issuer, guarantor and clearer of MX currency options. The CDCC is the intermediary between every buyer and seller, serving as the counterparty to every trade and removing counterparty credit risk.

How to calculate the settlement of a currency option

The settlement formula for a currency option at expiration is as follows:

$$\textbf{Call option} = \frac{(\text{Exchange rate} - \text{Strike price})}{\text{1 unit of the underlying}} \times 10{,}000 \text{ units of the underlying} \times \frac{\text{C\$1}}{\text{100 cents Canadian}}$$

$$\textbf{Put option} = \frac{(\text{Strike price} - \text{Exchange rate})}{\text{1 unit of the underlying}} \times 10{,}000 \text{ units of the underlying} \times \frac{\text{C\$1}}{\text{100 cents Canadian}}$$

Selecting a currency options trading strategy

	Forecasted Future Exchange Rate		
	Higher (increase in the value of the underlying currency)	**Stable**	**Lower** (drop in the value of the underlying currency)
Strategies	Buy calls	Sell calls	Sell calls
	Sell puts	Sell puts	Buy puts

Trading strategies with currency options

For reasons of simplicity, options are held to expiry in the examples. As well, examples do not account for commission costs, transaction fees and margin requirements.

1. Speculating

Buying call options to profit from a rise in the U.S. dollar

The value of a call option tends to rise as the value of the underlying currency increases. As a result, the holder will cash in a profit if the value of the call option at expiry is higher than the premium paid for the call. In other words, if the reference rate is above the strike price plus the premium paid. If the reference rate is lower, the holder's loss is always limited to the premium paid.

Assume that, on October 3, 2005, an investor anticipates that the U.S. dollar will strengthen against the Canadian dollar. The USD/CAD is 116.58 cents Canadian per U.S. dollar. The investor purchases 10 USX NOV 116.50 call options for a premium of 1.26 cents Canadian per U.S. dollar.

Total premium = 1.26 cents Canadian/US$1 x US$10,000 x C$1/100 cents Canadian
= C$126 x 10 options
= C$1,260

At expiration, the USD/CAD has risen and the Bank of Canada's USD/CAD noon rate is 119.02 cents Canadian per U.S. dollar. The investor will realize a profit of:

Call option settlement $= \frac{(119.02 - 116.50) \text{ cents Canadian}}{\text{US\$1}} \times \text{US\$10,000} \times \frac{\text{C\$1}}{100 \text{ cents Canadian}}$
= C$252 x 10 options
= C$2,520

The investor has turned his C$1,260 investment into C$2,520. A return of 100% compared with a rise of 2% in the underlying.

If, however, the USD/CAD exchange rate declines below the strike price of 116.50 cents Canadian per U.S. dollar at expiration, the options expire worthless and the holder cannot lose more than C$1,260 (the premium paid).

Selling call options to profit from a fall in the U.S. dollar

Although selling call options is a riskier strategy than buying put options, some investors prefer it in a bear market as they can act on their views without any cash outlay. Instead, sellers collect premiums.

An investor anticipates that the U.S. dollar will weaken against the Canadian dollar. The investor decides to sell call options since a drop in the U.S. dollar would result in a drop in the value of the call options sold. If he predicted right, the investor can repurchase the same call options at a lower premium to cash in a profit or the investor can keep the entire option premium if the USD/CAD exchange rate is below the strike price of the call options sold at expiration.

On April 4, 2006, the USD/CAD exchange rate is 117.10 cents Canadian. After determining the maximum exposure he can tolerate, the investor sells USX JUN 117 call options for a premium of 1.52 cents Canadian per U.S. dollar.

$$\textbf{Option premium collected} = 10 \times \frac{1.52 \text{ cents Canadian}}{\text{US\$1}} \times \text{US\$10,000} \times \frac{\text{C\$1}}{100 \text{ cents Canadian}}$$

$$= \text{C\$1,520}$$

At expiration, on June 16, 2006, the USD/CAD has dropped to 112.29 cents Canadian per U.S. dollar and the call options expire worthless as the investor's outlook for a weaker U.S. dollar against the Canadian dollar has been realized. As a result, the investor gets to keep the entire premium of C$1,520 on the call options sold.

However, if at expiration, the U.S. dollar had increased and the USD/CAD exchange rate had increased from 117.10 to 119, the investor would have been assigned and he would have paid the holder C$2,000 [10 x (119 – 117) cents Canadian/US$1 x US$10,000 x C$1/100 cents Canadian].

2. Hedging

Currency options are effective tools for Canadian investors and companies to hedge currency exposures. The owner of a nonCanadian dollar asset, such as a U.S. equity portfolio, stands to lose money in Canadian dollar terms if the U.S. dollar depreciates against the Canadian dollar. Currency risk can be hedged by buying a put option on the U.S. dollar, as the value of the option should increase if the U.S. dollar falls.

Conversely, the holder of a nonCanadian dollar liability (for example: a Canadian investor who plans to buy a property in the United States) faces the risk of the U.S. dollar rising against the Canadian dollar, which would increase the liability in Canadian dollar terms. An investor can hedge this risk with a call option on the U.S. dollar, which should increase in value if the U.S. dollar rises.

The number of options needed to hedge a given amount of foreign exchange:

$$\textbf{Number of options} = \frac{\text{Foreign exchange amount to hedge}}{\dfrac{\text{Contract size of the option}}{\text{Delta } (\Delta) \text{ of the option}}}$$

$$\textbf{Cost of the options in Canadian dollars} = \text{Number of options} \times \frac{\text{Option premium}}{\text{1 unit of the underlying}} \times \text{10,000 units of the underlying} \times \frac{\text{C\$1}}{\text{100 cents Canadian}}$$

Note: Option premium is expressed in cents Canadian per unit of foreign currency.

Hedging a U.S. equity portfolio

Consider, for example, a Canadian investor who holds a U.S. equity portfolio worth US$100,000 on March 28, 2006. With an exchange rate of USD/CAD 117.00, the portfolio is worth C$117,000. However, if the U.S. dollar depreciates, the investor will incur a loss in the value of the portfolio in Canadian dollar terms.

The investor can hedge against this risk by buying USX put options as follows:

$$\textbf{Number of put options to buy} = \frac{\text{US\$100,000}}{\frac{\text{US\$10,000}}{|\ 0.50\ |^*}} = \text{20 put options are needed to hedge currency exposure}$$

*0.50 being the delta of an at-the-money put option

The investor buys 20 USX MAY 117 put options at a price of 1.40 cents Canadian.

$$\textbf{Cost of the options} = \frac{\text{20 x 1.40 cents Canadian}}{\text{US\$1}} \times \text{US\$10,000} \times \frac{\text{C\$1}}{\text{100 cents canadian}}$$

$$= \text{C\$2,800}$$

The hedge represents an investment of C$2,800 in the put options, which can be thought of as the investor paying 2.4% as an insurance premium on the equivalent C$117,000 portfolio.

Consider the following scenarios at expiration:

a) A 4% drop in the U.S. dollar. At expiration, on May 19, 2006, the Bank of Canada's USD/CAD noon rate is 112.33. In this case, the US$100,000 portfolio is worth just C$112,330—a loss of C$4,670. After exercise, the investor's account will be credited an amount of:

$$\textbf{Put option settlement} = \frac{\text{(117 – 112.33) cents Canadian}}{\text{US\$1}} \times \text{US\$10,000} \times \frac{\text{C\$1}}{\text{100 cents Canadian}}$$

$$= \text{C\$467 x 20 options}$$

$$= \text{C\$9,340}$$

Therefore, the investor's 20 put options are now worth C$9,340, which largely offsets the loss of C$4,670 in the value of the portfolio of U.S. stocks because of the change in the exchange rate and the investor's cost of C$2,800 for the purchase of the options.

b) A 4% rise in the U.S. dollar. At expiration, on May 19, 2006, the Bank of Canada's USD/CAD noon rate is 121.68. In this case, the US$100,000 portfolio is worth C$121,680. However, the put options expire worthless and the investor will lose the C$2,800 premium, loss compensated for by the gain on the exchange rate and in the value of the portfolio.

Again, there is no obligation to hold the options until expiration; they can be sold in the market at any time if the investor's strategy changes.

Hedging overseas cash flows – canadian exporter

More and more firms, large and small, have to buy and sell goods across national borders. More often than not, payment is made using foreign currency. Depending on the time it takes to pay or receive the money, what was once an economically viable transaction often becomes less profitable due to adverse currency movement. The problem is how to take out insurance on the transaction, while benefiting from any profitable currency movement.

For example, a Canadian exporter sells goods to an American distributor with payment due in 3 months in U.S. dollars. The exporter will benefit if the U.S. dollar appreciates against the Canadian dollar, but will receive less if it depreciates. How can the exporter protect himself against a falling U.S. dollar?

Put options can be used to protect or provide insurance against currency price declines. For example, a Canadian exporter of goods to the United States may well find it profitable to buy put options on U.S. dollars in connection with a specific sale of goods. The Canadian seller of goods will be at risk for any decline in the value of U.S. dollars relative to the Canadian dollar. Ideally, the seller would like to remove this risk and retain the capacity to receive more Canadian dollars for the goods if the U.S. dollar should rise in value.

The exporter can also enter into a synthetic position by buying an at-the-money put option and selling an at-the-money call options to reduce his insurance cost and, at the same time, to fix a floor rate.

Let's consider an exporter who, on March 28, 2006, wants to lock in an exchange rate for two months to protect a US$1,000,000 payment to be received in May. The USD/CAD exchange rate is 117 cents Canadian.

He establishes his synthetic position as follows:

- Purchase 100 USX MAY 117 put options at 1.40 cents Canadian
- Sell 100 USX MAY 117 call options at 1.13 cents Canadian
- Net cost: 0.27 cents Canadian

The net cost to fix the exchange rate for US$1,000,000 is C$2,700, which corresponds to a 0.23% insurance cost (C$2,700/C$1,170,000). If the rate decreases from 117 to 110, the exporter would lose C$70,000 if he were unhedged. As a hedge was established, the drop will only cost him C$2,700.

In May, the exporter receives his payment of US$1,000,000 which he converts into Canadian dollars at a spot rate of 1.1215 (112.15 cents Canadian) for an amount of C$1,121,500.

At expiry, on May 19, 2006, the Bank of Canada's USD/CAD noon rate is 1.1233 or 112.33 cents Canadian. Since options are in-the-money, the exporter receives a credit of:

$$\textbf{Credit} = 100 \text{ put options} \times \frac{(117 - 112.33) \text{ cents Canadian}}{\text{US\$1}} \times \text{US\$10,000} \times \frac{\text{C\$1}}{100 \text{ cents Canadian}}$$

$$= \text{C\$46,700}$$

His total revenues for the synthetic position are:

$$= \text{C\$1,121,500} + \text{C\$46,700} - \text{C\$2,700}$$

$$= \text{C\$1,165,500, corresponding to a 116.55 USD/CAD exchange rate}$$

The synthetic position allowed the investor to buy insurance at a lesser cost and to reduce losses because of adverse fluctuations in the U.S. dollar.

Conclusion

This manual has been prepared to give an introduction to the basics of trading options on currencies. Options on currencies, equities or stock indices have similar benefits and risks. The Equity Options Reference Manual can be useful to the interested investor.

The four basic currency options trades—buy calls, sell calls, buy puts or sell puts—combined with the variety of strike prices and expiration months give the investor almost unlimited strategy alternatives. Most of the more advanced strategies already employed by options traders—spreads, straddles, etc.—are also feasible with currency options. The advantages of limited risk and high leverage make currency options an attractive vehicle for the option buyer desiring to trade based on his views of future exchange rates.

U.S. dollar options specifications

Underlying Currency	U.S. dollar
Trading Unit	US$10,000
Contract Months	The first three months plus the next two quarterly months in the March, June, September, December cycle.
Strike Prices	Strike prices are expressed in cents per units of foreign currency. For example, 120.50 cents Canadian equivalent to C$1.2050.
Strike Price Intervals	Strike price intervals are set at a minimum of 0.50 cents Canadian per unit of foreign currency.
Premium Quotation	Option premiums are quoted in cents Canadian per unit of foreign currency. For example, a premium quotation of 0.75 cents Canadian for an option on the U.S. dollar represents an aggregate premium value of 0.75 cents Canadian/US$1 x US$10,000 x C$1/100 cents Canadian = C$75.
Minimum Price Fluctuation (Tick Size)	The minimum price fluctuation of the premium is 0.01 cent Canadian or a tick value of C$1 per unit of foreign currency. That is: 0.01 cents Canadian/US$1 x US$10,000 x C$1/100 cents Canadian = C$1.
Aggregate Premium Value	The aggregate premium value for a contract is the premium quotation multiplied by the trading unit of a contract.
Exercise Style	European style. Options may be exercised only on the expiration date.
Exercise Settlement	Cash settlement. The amount to be paid or received in final settlement of each option contract is determined by multiplying the trading unit by the difference between the strike price and the Bank of Canada's noon rate for the designated currency vis-à-vis the Canadian dollar on the expiration date.
Expiration Date / Last Trading Day	At 12:00 p.m. (Montréal time) on the third Friday of the expiration contract month.
Reporting Level	500 contracts, as specified in Rule Six of the Exchange.
Position Limits	75,000 contracts, as specified in Rule Six of the Exchange.
Minimium Margin Requirements	As specified in Rule Nine of the Exchange.
Trading Hours	9:30 a.m. to 4:00 p.m. (Montréal time)
Clearing Corporation	Canadian Derivatives Clearing Corporation (CDCC)

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