An Empirical Analysis of Hedging Instruments for Canadian Importers and Exporters: Option Contracts on USD/CAD (USX) in 2010

Mohammad Ali Kermanian

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Approval of the Institute of Graduate Studies and Research

Prof. Dr. Elvan Yılmaz
Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Banking and Finance.

Assoc. Prof. Dr. Salih Katırcıoğlu
Chair, Department of Banking and Finance

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Banking and Finance.

Assoc. Prof. Dr. Cahit Adaoğlu
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Cahit Adaoğlu _____

2. Assoc. Prof. Dr. Mustafa Besim _____

3. Assoc. Prof. Dr. Salih Katırcıoğlu _____

ABSTRACT

In a globalized world, international business managers deal with the international trade of goods and services and are exposed to financial exchange rate risk. The traders transfer various merchandizes and services among countries with the aim of making profit. However, their profit is sometimes affected by the fluctuations in the exchange rates during the trading period. The traders have some choices to cover their foreign exchange risk. This study makes an empirical analysis of different hedging strategies through option contracts on USD for covering the currency risk of Canadian importers and exporters from/to United States of America during 2010.

The findings show that for both Canadian importers and exporters, the hedged positions via shorting the options had performed better than the unhedged positions in most cases during the analysis period. However, the unhedged positions had performed better than the hedged positions via longing the options during the same period. The results related to synthetic hedging position, which is a combination of shorting and longing the options, show that the hedged positions for Canadian exporters had performed better than the unhedged position whereas the unhedged positions for Canadian importers had performed generally better than the hedged positions during 2010.

Keywords: foreign exchange market, currency hedging, exporters, importers, Canada

ÖZ

Küreselleşen bir dünyada, uluslararası işletme yöneticileri mal ve hizmetlerin uluslararası ticaretinde döviz riskine maruz kalmaktadırlar. Bu yöneticiler kâr amacı ile ülkeler arasında çeşitli mal ve hizmetleri ticaretinde bulunmaktadirlar. Ancak, kâr bazen döviz kurlarındaki dalgalanmalardan etkilenir. Yöneticilerin kur riskini yönetmek için bazı seçenekler bulunmaktadır. Bu çalışma, 2010 yıl için, Kanada'dan Amerika Birleşik Devletlerine ihracat ve Amerika Birleşik Devletleri'nden Kanada'ya ithalat yapan yöneticilerin kur riskri yönetmek için (hedging) kullandıkları USD opsiyon sözleşmelerini ampirik olarak incelemektedir.

Bulgular, analiz dönemi boyunca, hem Kanadalı ithalatçı hem de Kanadalı ihracatçılar, açık (short) hedge pozisyonların hedge edilmeyen pozisyonlara göre daha iyi performans gösterdikleri tespit edilmiştir. Ancak, aynı dönemde, uzun (long) opsiyon hedge pozisyonlarına göre, hedge edilmeyen pozisyonlar daha iyi performans göstermiştir. Kanada ihracatcilar için sentetik hedge pozisyonları (kısa ve uzun opsiyon kombinasyonları) hedge edilmeyen pozisyonlara göre daha iyi performans göstermiştir. Ancak, Kananda ithalatçıları için, sentetik hedge pozisyonları hedge edilmeyen pozisyonlara göre daha kötü performans göstermiştir.

Anahtar Kelimeler: Döviz piyasası, döviz, hedge, ihracatçılar, ithalatçılar, Kanada

To My Loving Wife

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INTRODUCTION

1.1 Background and Statement of the Problem

The story of trade has background in barter epoch when people used to exchange goods, works, or services for other goods or services rather than money. These days, thanks to technological breakthrough in banking and electronic commerce industries, most of the trades can be implemented in less than one second via internet.

A big volume of daily trades in the world are carried out between different countries requiring the use of hard foreign currencies. Since the emergence of floating exchange rate in different countries, frequent changes in the value of the currencies against each other, have been challenging issues for managers and traders over the world. All multinational corporations and traders of goods/services are always concerned with the fluctuation of the exchange rate for the period between signing the contract and the time of effecting the payment. However, in order to remove or at least minimize such risk, some hedging instruments are available. These hedging instruments include currency swap agreements, currency future contracts, and currency derivative contracts (in option, future, and forward markets).

Swap agreement manages the foreign exchange risk by exchanging principal (and also interest) in one currency for the same in another currency between two international

traders in opposite position. Foreign currency derivatives give a right to contract holder to buy or sell specific amount of a currency in terms of another currency at an agreed price within certain period of time. However, the derivatives contracts holders are supposed to pay a specific premium against such right. Previous studies and empirical evidences indicate that swap agreements are preferred in long term hedging whereas the other hedging instruments suit the short term hedging strategies. Geczy et al. (1997) argue that:

> "Currency swaps are more cost-effective for hedging foreign debt risk, while forward contracts are more cost-effective for hedging foreign operations risk. This is because foreign currency debt payments are long-term and predictable, which fits the long-term nature of currency swap contracts. Foreign currency revenues, on the other hand, are short-term and unpredictable, in line with the short-term nature of forward contracts" (p. 9).

Amongst the hedging strategies, foreign exchange (FX) option contracts play a significant role as their market is well organized and instruments are standardized (in terms of holding periods, strike prices and relevant premiums). In addition, the holders of such contracts are not bound to exercise the contract if they do not wish to. Although it is more expensive than other foreign exchange derivatives, it has the most flexibility for holders and thus, can be an attention-grabbing hedging instrument for importers and exporters. Regardless of all the aforementioned advantages for FX option contracts, still a couple of questions need to be answered in this respect to determine its competence. Given the experiences in real world, how efficient was this hedging instrument in practice so far? Will it still be beneficial for the traders when they pay such expensive premiums to obtain the option contracts? What about if the traders leave their positions unhedged?

1.2 Objective of the Study

The thesis will investigate the option contracts for Canadian importers and exporters who trade with the United States. In our research, Canadian Dollar (CAD) will be the base currency and we analyze how long put and long call options on US Dollar (USD) could cover the foreign exchange risk exposure for Canadian party specifically in 2010. In fact, the main objective of the study is to compare hedged vs. unhedged positions of Canadian traders under option hedging strategy. This will indicate whether the option contract is an appropriate method for hedging. The complementary aim of the study is to determine the best tactic among option hedging strategies.

It is important to study the foreign exchange risk between these two countries due to the following facts that have been extracted from website of U.S. Department of State[1]:

- Canada is the leading export market for 35 of the 50 U.S. states and is a larger market for U.S. goods than all 27 countries of the European Union.
- Canada is the single largest foreign supplier of energy to the United States- providing 20% of U.S. oil imports and 18% of U.S. natural gas imports.
- The United States is Canada's largest foreign investor. Statistics Canada reports that at the end of 2007, the stock of U.S. foreign direct investment in Canada was $289 billion, or about 59% of total foreign direct investment in Canada.
- Canada is the fifth-largest foreign investor in the United States.

[1] http://www.state.gov/r/pa/ei/bgn/2089.htm

1.3 Methodology and structure of the study

The study considers various premiums for long call and long put options on USD against CAD with the same or near exercise price for different periods (one week, one month, three months, 6 months, and one year) within 2010 and eventually by comparing hedged and unhedged positions, we measure the effectiveness of option contracts for Canadian importers and exporters in that year. In other words, we compare the situation in which no option is bought by Canadian party so that the exchange rate changes during the contract's period can either positively or negatively affect the profitability of business, with the situation in which they pay some premiums and utilize options as hedging instrument to be insulated from foreign exchange risk during that period. At the end, the study will try to find out which position has more advantages from the view point of Canadian importers and exporters in 2010. Meanwhile, the focus of the thesis is only on the option contracts since the forward market is not standardized and there is no accessible data for the future contracts on USX.

The results of our analysis which will be done for different periods in 2010 by comparing various exchange rates within 2010 and 2011 may provide the Canadian traders of goods/services with a hint or indication about the proper utilization of option contracts for hedging purpose in the following periods of time.

The organization of the thesis is as follow: the second chapter gives a comprehensive understanding to readers as to exchange rate and foreign exchange market. Then, the role of exchange rate for international traders of goods and services (particularly in USA and Canada) is demonstrated. The third chapter presents the concept of hedging the

foreign exchange risk for traders. Hedging is distinguished from speculation in this chapter. While different foreign exchange hedging strategies are explained, the chapter focuses on use of foreign exchange derivatives as hedging instrument. In the fourth chapter, the analyses of the most common hedging strategies via option contracts are carried out. The result is revealed afterward in this chapter which determines the efficiency of each strategy. At the end, the results are summarized as conclusion in the fifth chapter to which the references and appendices are attached.

Chapter 2

FOREIGN EXCHANGE MARKET

The chapter's core concentration is on the foreign exchange trade and market. First of all, the chapter provides explanations as to concept of exchange rate and foreign exchange market. Different exchange rate regimes are described. Then, the reasons for altering the exchange rates and the parties involved in this regard are discussed. Background of exchange rate market in America and Canada is explained and at the end, the chapter focuses on importance of exchange rate for international traders of goods and services.

2.1 Exchange Rate

Referring to barter epoch, people used to exchange goods, works, or services for other goods or services rather than money. After that era, gold and other precious metals were used as payment instruments till the time that money was invented. Since then, all trades have been easily carried out by medium of money. Various types of moneys exist in different countries with different names and values. However, people of one country might sometimes need to have access to other countries' moneys in order to perform foreign investments or international trades or travel to abroad as tourist. Therefore, they have no choice but exchanging their own money for money of another country. The problem arises here is the difference between values of the currencies in exchange.

According to economic and political status of one country, its money has specific value in comparison to currencies of other countries.

Exchange rate determines the value of one currency with the aim of converting to another one. It implies, how many units of a currency should be given in order to receive one unit from another currency. For instance, consider that the value of one Euro is equal to 1.2 U.S. dollar (USD). In this case, a German tourist who needs USD for traveling to America, will receives 1.2 USD against each Euro he gives. Similarly, he should pay 1.2 USD in order to buy 1 Euro in return to home if some extra dollars remained in his pocket. Conversely, value of each USD can be deemed equal to 0.83 of each Euro. In other word, 0.83 of one Euro can be given to receive one U.S. dollar.

The exchange rate is a bilateral concept. All currencies are always quoted in terms of other currencies. One cannot specify a single price for a currency without determination of a pair for it. It means one currency such as USD may be appreciated against Swiss franc but simultaneously depreciates against another currency such as Euro. This situation is materialized when economy of America works better than that of Switzerland but worse than that of Eurozone countries. It is also possible that one currency appreciates or depreciates against all other currencies due to its good or bad performances.

For realizing how international value of a currency moves, its trade weighted index or effective exchange rate should be computed. The trade weighted index is multilateral exchange rate of a currency against other currencies. In order to calculate it, one should

compute average of the home country's bilateral exchange rates against currencies of the countries which have the highest volume of mutual trade with the home country. The trade ratios of the home country's trading partners should be also multiplied by each these bilateral exchange rates to reach the effective exchange rate. If the trade weighted exchange rate of a currency in this year is greater than that of the said currency in last year, it shows that international value of this currency has increased. To illustrate the matter, consider that the only trade partners of the USA are England and Eurozone countries with trade ratios of 0.3 and 0.7 and bilateral exchange rates of 0.63 and 0.79 respectively. The effective exchange rate of America will be (0.30* 0.63) + (0.70 * 0.79) = 0.742

Current exchange rate always reflects news about previous performance of a country respecting other countries. As a matter of fact, what a country does in terms of its politics and economy will be reflected in the value of its currency in near future.

The major USD currency pairs and the major pair currencies other than USD which are frequently traded along with the information related to them, extracted from website of International Standardization Organization, have been mentioned in the following tables.

Table 2.1: The Major U.S. Dollar Currency Pairs

Currency Pairs	**Countries**	**Name**	**Nickname**
EUR/USD	Euro/U.S.	Euro-dollar	N/A
USD/JPY	U.S./Japan	Dollar-yen	Gopher
GBP/USD	United Kingdom/U.S.	Sterling-dollar	Sterling or Cable
USD/CHF	U.S./Switzerland	Dollar-Swiss	Swissy
USD/CAD	U.S./Canada	Dollar-Canada	Loonie
AUD/USD	Australia/U.S.	Australian-dollar	Aussie or Oz
NZD/USD	New Zealand/U.S.	New Zealand-dollar	Kiwi

Source: International Standardization organization (www.iso.org)

Table 2.2: The Most Actively Traded Cross Pairs

Currency Pairs	**Countries**	**Market Name**
EUR/CHF	Eurozone/Switzerland	Euro-Swiss
EUR/GBP	Eurozone/United Kingdom	Euro-sterling
CAD/JPY	Canada/Japan	Canada-yen
EUR/JPY	Eurozone/Japan	Euro-yen
GBP/JPY	United Kingdom /Japan	Sterling-yen
AUD/JPY	Australia/Japan	Australian-yen
NZD/JPY	New Zealand/Japan	New Zealand-yen

Source: International Standardization organization (www.iso.org)

More currency pairs might be quoted by different brokers over the world. However, for calculating the exchange rate of uncommon currency pairs such as Australian dollar to

Canadian dollar (AUD/CAD), a major currency such as U.S. dollar is used. In this case, the exchange rate of USD/CAD should be divided by the exchange rate of USD/AUD in order to realize AUD/CAD exchange rate. By this approach, we can also find the rates for conversion of lots of other currencies to each other only if we have access to few exchange rates.

2.2 Foreign Exchange Market

Foreign exchange market or FOREX is a kind of market for decentralized buying and selling of currencies with a very large daily turnover. Foreign exchange markets consist of commercial companies, central banks, hedge funds, banks, investment management firms, and retail investors.

This market used to be based on face to face negotiation or telephone trading. However, due to new technologies, nowadays, the foreign exchange trading is mostly fulfilled via internet or through interbank network systems in a short period of time. As this market is really liquid and vast, people believe that this is the most efficient financial market. History of foreign exchange market goes back to many years ago. Einzing (1970) states that:

> The first foreign exchange markets consisted of meeting-places of money-changers functioning in commercial centers. They were familiar figures in market places and harbors in the Ancient Middle East and Greece, with their tables, scales and weights, displaying a variety of domestic and foreign coins (p.18).

Participants of FOREX market are divided into two parties. Big participants such as commercial and central banks on the one hand and retail traders on the other hand. The participants buy and sell foreign currencies with the aim of managing their foreign

exchange risk or for the purpose of speculation. Trades in FOREX are performed through lots of brokers over the world. Brokers, by matching buy and sell orders, play role of middleman between counterparties. Whenever a trader gives an order of exchanging a sum of U.S. dollar to its equivalent in Euro currency, the broker matches it with another order in opposite position (i.e., order of selling Euro and buying USD).

The brokers quote the buying and selling prices of currencies and preserve the difference between such buy and sell prices as their own profit (bid-ask spread). Currencies are mentioned with their abbreviations in the quotations. For instant, price of each Euro in terms of U.S. dollar is quoted as Euro/USD. The first currency is always the base and the second one is the counter currency.

Actually the price, given by a broker, is the price for buying or selling the base currency but in terms of the counter currency. Two prices are always shown under such quotation. The first one in left side (or upside) is called bid price and the second one in the right side (or downside) is called ask price. Bid price is the price that the broker pays (in counter currency) to purchase one unit of the base currency but ask price is the price that the broker receives (in counter currency) to sell one unit of the base currency. The difference between selling and buying price (broker's profit) is called spread.

Foreign exchange market operates on nonstop basis 24 hours a day. Once the brokers in one country stop working, other brokers in another country start working so that working hours of brokers in different countries overlap. Thus, traders are able to work

with various brokers in different countries at any time during day and night while sitting behind their computers. Galant and Dolan (2007) state that:

> There is no officially designated starting time to the trading day or week, but for all intents the market action kicks off when Wellington, New Zealand, the first financial center west of the international dateline, opens on Monday morning local time. (p.9).

Some brokers always preserve a fixed amount of spreads and others quote variable spreads changing time to time. The spreads that the latter provides might be different during the days of a week or even hours or minutes of a day. Statistically, the average spreads of the fixed spread based brokers are generally higher than those of variable spread based brokers. This issue causes the overall profit of traders via variable spread based brokers to be higher than the overall profit of the traders via fixed spread based brokers.

The quotations are normally shown with four decimals. The last decimal is called pip. Generally fluctuations in exchange rates are described in unit of pip. Bickford (2005) states:

> A percentage in point or pip is the smallest commonly quoted change of an exchange rate of a currency pair. The major currencies, except the Japanese yen, are priced to four decimal places. (p.36).

In foreign exchange market, most of deals involve immediate delivery. It is called spot transaction and means that the parties involved in transaction are supposed to honour their oblations (deliver the sold currency and receive the bought one) within two business days.

There is also another type of transaction in this market namely forward transaction. This

type of transaction involves future delivery of the currencies. In fact, the parties agree to exchange their currencies in a future date at a predetermined rate. Reuters Financial Training (1999) explains the forward transaction as below:

> A forward outright FX transaction is an FX deal between two counterparties in which one currency is bought in exchange for another at a rate which is agreed today, for delivery at an agreed future date (p.90).

Forward transaction is deemed as a non-negotiable deal. It is traded over the counter. It is quite notable to keep in mind that the forward rate is not an anticipation of the spot rate in future and it is completely different transaction. The banks generally quote their forward quotations with one, two, three, six, and twelve months maturity.

2.3 Exchange Rate Regimes

Exchange rate regime means the policies that government of a country imposes regarding international treatment of the country's exchange rate. The exchange rate regimes are generally divided into two categories: fixed and floating regimes. However there are some more regimes between these two such as Dirty/Managed Floating, Pegged Float, Currency Board, and Dollarization. Hereunder, the three most important regimes among them are explained.

2.3.1 Fixed Exchange Rate Regime

In this regime, governments announce a fixed exchange rate between the country's currency and currencies of other countries over the world. Then, the governments intervene in the market and do not allow the exchange rate to move freely. For example, if we presume Turkey as the home country with fixed exchange rate regime, government can impose an exchange rate of 1.7 as USD/TL which has no possibility whatsoever to be freely changed over the time.

In this regime, there are some regulatory restrictions as to foreign currencies by the government. One cannot purchase or sell foreign currencies without permission of the government. Every transaction that involves foreign currency should be under control of the government.

The major advantage of this regime is that people are almost not exposed to foreign exchange risk. The major disadvantage of the regime is that people, who need to deal with foreign currencies like international traders and parents whose children study in abroad, confront difficulties.

If demand for currency of home country such as TL increases, the government intervenes and try to offset such excess demand by publishing more local currency. If demand for foreign currency such as USD increases, the government has to sell its dollars from foreign reserve account to supply more USD in the market and offset the excess demand for USD. In case the excess demand for USD continues to exist for long period, the government has no choice but announce a new exchange rate which complies with the latest market status.

2.3.2 Floating Exchange Rate regime

Floating regime allows the exchange rate to move freely in the market based on real demand and supply. There is no governmental intervention in floating regime. The main advantage of this regime is that the deals involving foreign currencies like imports and exports are done smoothly which in long run results in augmentation of general social welfare and standard level of living in those countries. The disadvantage of floating regime is that people are exposed to foreign exchange risk. Even people like local

manufacturers that sell their products solely inside the country and do not deal with foreign currencies are affected by changing the exchange rate. Appreciation of local currency increases the imports and vice versa. For sure, changes in volume of importation and exportation influences the price of the goods in the market because of competition between local and foreign producers.

Floating exchange rate is perfect regime for the countries with low inflation rate. Friedman (1953) said "the argument for flexible exchange rates is, strange to say, very nearly identical with the argument for daylight savings time."

2.3.3 Dirty Floating Exchange Rate Regime

Under managed or dirty floating regime, the exchange rates are determined by demand and supply but up to a certain level. It means that the governments in countries with this regime let the market determine price of currencies however they impose a limitation for changes in exchange rates. So if such changes exceed the specified level, the government manipulates the market's demand and supply in order to keep the exchange rates in the desirable level. Most of the countries such as U.S. and Canada use this exchange rate regime nowadays.

2.4 What Parties Affect Exchange Rate?

Exchange rate, like other merchandises, is under direct effect of demand and supply. Accordingly, changing in the level of demand or supply for one currency against another one can alter the relevant exchange rate. The main parties that have the highest influence on movement of the exchange rates are international traders of goods and services (exporters and importers), international investors, and speculators.

2.4.1 Importers and Exporters

As the exporter's currency is generally used as the payment currency in an international trade, whenever volume of import and export between two countries changes, the conversion rate between their currencies also changes. Considering Turkey as the home country and U.S. as its trade partner, whenever Turkish traders increase their import from U.S., the rate USD/TL will increase. In point of fact, for importing more goods and services from U.S., the Turkish traders need to provide the additional foreign currency in USD. For this purpose they should sell their own currency which is TL. By this, demand for USD and supply for TL will be increased and reduced respectively that will lead to appreciation of USD against TL.

Conversely, if TL is used as export currency of Turkey, whenever volume of export from Turkey to USA increases, the American traders will be forced to sell their USD in order to provide the required additional TL. Predictably enough, volume of USD currency in the market will be increased so that demand for TL will be increased and supply for USD will be decreased in the foreign exchange market. As a result, the respective exchange rate will be reduced.

2.4.2 International Investors

Similar to what has been described above, any change in volume of international investment between two countries has direct impact on their mutual exchange rate. Again, if Turkey is considered as the home country and U.S. as the foreign country, the following scenarios will take place.

In case, a great number of Turkish businessmen decide to invest in U.S. (let us consider

buy holiday houses in Beverly Hills), they need to provide the required money in USD currency to pay to American sellers. So they sell their own currency (TL) and buy USD. It implies more demand for USD and less demand for TL. In other word, less supply for USD and more supply for TL which will result in appreciation of USD against TL.

On the other hand in case American businessmen decide to invest in Turkey (let us consider purchase of some hotels in southern towns of Turkey), they are forced to exchange their currency and pay the relevant fees to Turkish owners in TL assuming that the transaction will take place in TL. It will result in augmentation of demand for TL in foreign exchange market. Consequently, value of Turkish Lira will be increased respective to U.S. dollar.

2.4.3 Speculators

Speculators and arbitrageurs play an important role in foreign exchange market. Arbitrageurs attempt to profit from price inefficiencies in the market by making simultaneous trades that offset each other and capturing risk-free profits. Speculators also buy and sell foreign currencies with aim of benefiting from fluctuation of the exchange rates but they accept risk. The traders in foreign exchange market interpret the news and anticipate the future rate of conversion between currencies. Accordingly, they make decision to buy and sell the currencies.

Whenever the speculators predict that international value of a specific currency such as Euro will depreciate whereas that of another currency like British Pound (GBP) will appreciate, they try to sell their Euros and buy GBP in order to take advantage of increasing GBP/EURO exchange rate in future. Once lots of speculators decide to

purchase GBP, demand for GBP increases. This occasion will lead to appreciation of GBP.

Nonetheless, if they continue to issue more and more purchase orders for GBP and sell orders for Euro, it might result in adverse movement of the exchange rate because volume of GBP will be increased but that of Euro will be decreased in the market after a while. In fact, lots of speculators will possess GBP while fewer speculators possess Euro in the market. According to Galae (1995), excess supply leads to price deprecation but excess demand leads to prices appreciation based on the demand and supply law. In this case, extra GBP means excess supply of GBP that can be resulted in deprecation of this currency. That's why people believe foreign exchange market is the most efficient financial market. Impacts of news are reflected in the market really rapidly. Timmermann and Granger (2004) define the efficient market as follow:

> An efficient market is thus a market in which predictability of asset returns, after adjusting for time-varying risk-premia and transaction costs, can still exist but only 'locally in time' in the sense that once predictable patterns are discovered by a wide group of investors, they will rapidly disappear through these investors' transactions (p. 21).

2.5 Foreign Exchange Market in USA and Canada

Canada and USA have both high volumes of annual foreign exchange transactions. Details about each of them are described in the following sections.

2.5.1 Canadian Foreign Exchange Market

Foreign exchange market in Canada is based on floating exchange rate regime but with the lowest possible level of governmental interventions. Regulations and monetary policies are imposed by Bank of Canada which acts as the central bank for Canada since

1935. In exceptional cases like when Canadian dollar is in temporary turbulent condition, Bank of Canada intervenes in the market to modify the status of the market. According to Canadian foreign exchange committee (2010):

> Canada is the 11th largest FX market by average daily volume and the CAD is the 7th most traded currency in the world. Canadian dollar transactions executed in Canada account for about 25% of global CAD turnover. (p. 6).

Canadian foreign exchange committee is an organization that deals with various issues as to foreign exchange market in Canada. This committee disposes different forums for discussion about development of foreign exchange market in Canada. It also aims to analyze and review the technical issues for practicing the trade of foreign currencies in the market. All technical issues in the committee are under supervision of senior officers from institutions that actively trade the foreign currencies in the Canadian foreign exchange market. Their meetings since 2003 have been held in Toronto, Montreal, and Ottawa. Canadian foreign exchange committee is in close working relationship with American foreign exchange committee in New York, foreign exchange joint standing committee in London, European central bank (ECB), Treasury market association in Hong Kong, and many other important foreign exchange organizations over the world. According to the latest annual report of this committee, the total foreign exchange turnover of Canada in 2011 was 1,047.2 billion of US dollar comprising 319.1 billion dollar in spot transactions, 115.5 billion dollar in outright forward transactions, and 572.6 billion dollar in swap transactions. (www.cfec.ca/files/annualreport11_e.pdf).

2.5.2 American Foreign Exchange Market

Most of annual foreign exchange transactions over the world have a dollar leg. The U.S. foreign exchange market builds a big portion of the U.S. economy. Such market is one

of the significant sources of revenue for American government. Presently, the U.S. dollar is the most accepted type of foreign exchange in the world. U.S. dollar ranks as one of the five major currencies of the world. Several countries use USD as their functional currency. This process is called dollarization. Regulations of U.S. foreign exchange market are set out by the American Federal Reserve Bank. The U.S. dollar and banknotes are exclusively issued by this organization. Global recognition of U.S. dollar and its great liquidity caused it to be deemed to be the standard medium of foreign exchange in the world.

Foreign exchange regime in the United States is similar to that of Canada. That is to say, the U.S. government may intervene into the market either directly or indirectly in order to alleviate or eliminate the market disorder but only when the deviation of excess demands or supplies from the prearranged monetary objectives exceeds a certain level.

According to foreign exchange committee of U.S.A., semi-annual foreign exchange volume survey in October 2011, the average daily volume of foreign exchange in U.S.A. is 976,746 million dollar comprising 564,466 million dollar in spot transactions, 135,291 million dollar in outright forwards, 245,173 million dollar in foreign exchange swaps, and 31,816 million dollar in over the counter foreign exchange options (http://www.ny.frb.org/fxc/2011/octfxsurvey2011.pdf).

2.6 Significance of Exchange Rate for International Traders

Importers and exporters of goods and services are supposed to be fully aware of their foreign exchange risk exposure once they enter into a contract of international sales of goods. Exchange rate plays a significant role in profitability of an international deal.

Once a trader purchases or sells a merchandize on a national scale, he pays and receives money with the same currency but if such trader buys the same merchandize from a vendor in another country, he is supposed pay in exporter's currency as per custom of international trades. Nonetheless, importers and exporter are able to come into an agreement regarding currency of payment however both of them generally prefer the payment currency to be the currency of their country to avoid the exchange rate risk.

The point is that there is usually a gap between the time that importers and exporters sign the contract and the time of effecting payment. Movement of the exchange rate during such gap affects both parties either negatively or positively.

Under the assumption that payment currency is currency of the exporter's country, an importer can be adversely affected by fluctuation of the exchange rate if currency of his country depreciates against currency of exporter's country during the above mentioned gap. If this is the case, the importer will be forced to provide more money in currency of his country to cover the same payment value in currency of the exporter's country. On the contrary, the importer can benefit from alteration of the exchange rate if currency of his country appreciates against currency of the exporter's country because he will need to pay less in his currency to honour the same payment under the import contract.

In some special trades such as oil business between governments, USD is always used as the payment currency even if the currency of the exporter's country is something else. Example of this case is Saudi Arabia that holds Rial currency but receives its oil exports revenue in USD. If Rial devaluates, the oil export revenue of Saudi Arabia which is in

USD will produce more Rial for Saudi government. Of course, revaluation of Rial against USD can reversely diminish the oil export revenue for Saudi government. Generally devaluation of currency of country A against currency of country B will foster country B to increase its import from country A as products of country A will be cheaper for country B to purchase. On the other hand appreciation of currency of country A against currency of country B will reduces level of importation from country B to country A as products of country A will be more expensive for country B to purchase.

In view of the aforesaid explanations, it is crucial for international traders to cover their foreign exchange risk in order to prevent the adverse effects of alterations in exchange rates. For this purpose, some foreign exchange hedging instruments are available that are entirely illustrated in the next chapter.

Chapter 3

HEDGING STRATEGIES

This chapter distinguishes hedging from speculation concentrating on the foreign exchange market and describes the available foreign exchange hedging instruments for international traders of goods and services. Application of each hedging instrument, especially option contract, is explained in the chapter.

3.1 Hedging

Majority of the trades in real world are carried out with the aim of making profit. According to the nature of each business, traders (either currency traders or traders of merchandises and services) consider a specific margin for their business. In practice, the realized margin is sometimes less or even more than what has been considered in this respect due to reasons beyond control of the traders. Such change in the amount of realized margin definitely affects the total portfolio of the traders either positively or negatively.

The traders are able to hedge their positions in order to eliminate or at least reduce the possibility of potential change in the margin. In fact, by hedging, the trader's margin can be locked in an explicit target. The most important advantage of being hedged in a trade is that the trader can concentrate solely on his business and does not need to be

concerned about any other things that affect the targeted margin. Furthermore, hedging provides other advantages such as tax benefit for firms. Nance et al.(1993) state:

> The accumulated evidence suggests that the firm's hedging decision is made the same way other financial decisions are made: Firms hedge to reduce expected tax liabilities, to lower expected transactions costs, and to control agency problems (p. 280).

Depending on the type of business and inherent potential risks, there are some choices for hedging such as interest rate hedging or currency hedging. Same as all other insurances, hedging is not without cost. The trader should usually pay a specific premium as hedging cost.

3.2 Speculation

While hedging aims to lock the targeted margin in a specific amount, speculation aims to benefit from changes that occur in a specific rate or price. A person that is involved in speculation is named plunger or speculator. Speculation is based on anticipation of future rate/price and does not guarantee any positive return. It also does not guarantee the return of capital investment. Speculators in capital market buy and sell securities to make profit from altering their prices/rates. Kaldor (1939) describes the speculators along with process of speculation as follows:

> Speculators are people of better than average foresight who step in as buyers whenever there is a temporary excess of supply over demand, and thereby moderate the price-fall; they step in as sellers, whenever there is a temporary deficiency of supply, and thereby moderate the price-rise (p. 1).

3.3 Foreign Exchange Hedging

Foreign exchange or currency hedging is one of the most applicable types of hedging especially in the fields of international investments or trade. The exchange rate and its fluctuation in an international investment is a significant factor affecting the business's profitability because firms should convert foreign currencies to home currency (in case of receivables) and vice versa (in case of payables). Currency hedging, using different hedging instruments as illustrated in the following sections, can reduce the foreign exchange risk so that an investor or trader can be more or less isolated from the adverse impacts of fluctuating exchange rates. Even a FOREX trader, whose profit is made by fluctuations in the exchange rates, is able to reduce his potential loss by utilizing some hedging methods.

3.4 Foreign Exchange Hedging Instruments: Approaches for International Traders

Once an import contract is concluded, there is always a concern by the importer regarding depreciation of home currency against the foreign currency during the contract period since such depreciation increases the payment amount in home currency. Conversely, the importer gets excited if the home currency appreciates during the aforesaid period. Position of the exporter and his concerns in this respect is exactly in opposite side. It is obvious that such potential changes in revenue or payment value of an international trader can dramatically demolish the trader's calculations and considerations as to profitability of the main business.

Before describing the currency hedging instruments for exporters and importers, it is crucial to describe the concept of derivatives. Derivatives are sort of guaranteeing for a

future price such as price of a car on a future date. According to Cecchetti (2008), "a derivative is a financial instrument whose value is derived from the value of some other financial instrument, called the underlying asset" (p.196). Purchasing (longing) derivative on an underlying asset is an agreement that makes the buyer able or obliged to buy that underlying asset in future. Conversely, selling (shorting) derivative on that asset means that the seller (writer) may or must sell it on or within a specific date in future. For example, if someone in stock market longs a derivative on stock of Google Inc., depending on type of the relevant contract, he will be able or forced to buy a share of Google on or within agreed date in future.

Derivatives are traded on various stocks, commodities, interest rates, credits, exchange rates, indices, and many other things like forecast of weather in future. Derivatives are employed either for leverage or hedging purposes. One may also utilize derivatives when there is not possibility of trading in the underlying like weather derivatives.

Unlike what most of people think, derivative trading is not a new business. History of derivative refers to very long time ago. Hetamsaria (2005) states:

> The history of derivatives is surprisingly longer than what most people think. Some texts even find the existence of the characteristics of derivative contracts in incidents of Mahabharata. Traces of derivative contracts can even be found in incidents that date back to the ages before Jesus Christ. (p.1).

Derivatives are generally traded under two categories. Firstly, over the counter (OTC) in which buyers and sellers directly deal with each other without involvement of any middleman, exchange, or intermediary. Forward rate agreements and swaps are good examples of the products that are mostly traded under this category. For sure, there is

always default risk in this market as the parties only rely on each other to honour their obligations under relevant contracts. Secondly, exchange traded derivatives (ETD) that is a market where expert derivative exchanges act as intermediary between buyers and sellers. The contracts in this market are standardized and the counter party or default risk is less than OTC market. As a matter of fact, the exchanges charge initial margin from both parties and act as guarantor instead. In general, derivative contracts are classified as follow: swaps, forwards, warrants, options, futures, and binary options.

Depending on situation of the trader and nature of the related business, currency swap agreements, currency future contracts, and some other financial instruments may be utilized for currency hedging purpose by exporters and importers so that they can either eliminate or lessen their foreign exchange risk in international deals.

3.4.1 On Balance-Sheet Hedging

Multinational corporations that largely deal with other countries might be able to match their receivables and payables denominated in the same foreign currency in terms of maturity and value. According to Sounders and Cornett (2006), on-balance-sheet hedging involves making changes in the on-balance-sheet assets and liabilities to protect the firm from foreign exchange risk. Let us suppose an American corporation which has regular trade with European companies. In order to remove the foreign exchange risk, this corporation is supposed to match its receivables and payables denominated in Euro in terms of maturity and amount. For example, if this firm can match the timing and value of its imports of Mercedes Benz cars from Germany with those of its exports of Apple laptops to Denmark, the firm will not be affected by any movement in Euro/USD exchange rate during the contracts' period.

This is the same approach that banks use for their assets and liabilities denominated in foreign currencies to cover the exchange rate risk. The advantage of this type of hedging is that the company can hedge itself internally without any extra cost. The disadvantage of it is that the approach is only applicable for large and multinational commercial corporations with both receivables and payables in foreign currencies.

Meanwhile, in case the firm does not have bilateral trade relation with another country and only imports from that country, the firm can still go to hedged position by separate investments in foreign currency. For example, if a U.S. based corporation imports 100,000.00 GBP from England and does not have any export to that country, for hedging against any loss from increasing the GBP/USD exchange rate, it can purchase a risk free bond denominated in sterling pound for 100,000.00 GBP. Hence, any potential loss on import contract resulting from depreciation of USD against GBP during contract period can be equivalently compensated by the gain on the purchased bond.

3.4.2 Currency Swap Agreement

Swap implies the reciprocate exchange of two currency risk exposures. Under a currency swap agreement, two international traders with opposite currency risks agree to reverse their foreign exchange position in terms of both principal and interest rate with each other within a specific period.

For example, a British exporter who has some receivables in Euro can agree with a Dutch exporter who has some receivable with the same value in present but in GBP currency to exchange their export revenue on a specified future date with a predetermined exchange rate (typically, the present exchange rate). Assume that the

export revenue of the British trader is 14,000.00 Euro which is equivalent to 10,000.00 GBP at present time if GBP/Euro exchange rate is 1.4. On the other hand, suppose that the export revenue of the Dutch trader is 10,000.00 GBP which is equivalent to 14,000.00 Euro according to the same exchange rate. By entering into currency swap agreement; these two exporters will be isolated from adverse effects of changing the exchange rate during the contract period. However, they both will be unable to benefit from positive movements of the exchange rate. In other words, no matter what the exchange rate is on payment date, the presumed Dutch and British exporters will receive respectively equal to 14,000.00 Euro and 10,000.00 GBP after conversion of the export revenue to home currency. The hedging procedure for importers under this hedging instrument is exactly same as what has been explained for exporters.

First currency swaps were agreed in 1970 between some British and U.S. companies which used to deal with each other frequently. The main advantage of swap agreement for currency hedging is that the traders are not borne any cost for using this hedging instrument as the swap agreements are concluded over the counter.

Currency swap agreement is a common foreign exchange hedging instruments for international traders of goods and services in developed countries who are holders of hard currencies. However, in developing countries which hold soft currencies, there is not much possibilities for traders to use this hedging instrument because in practice, most of imports and exports in such countries are carried out in hard currencies like Euro or USD. As an example, it is very difficult for an Iranian exporter who has receivable of 100,000.00 USD to find another trader in other countries with equal

receivable in Rial currency. Another problem for usage of currency swap between developing countries (soft currency holders) and of developed countries (hard currency holders) is that the fluctuation of the exchange rate is mostly depreciation of soft currencies against hard currencies. It is due to the fact that inflation rate is generally higher in developing countries that in long run leads to depreciation of their currencies against currencies of developed countries. Therefore, since the direction of long term changes in exchange rate is usually predictable favouring hard currencies; the traders with receivables in hard currencies are rarely willing to exchange their currency risk exposure with traders who have receivables in soft currencies.

3.4.3 Currency Futures and Forwards

Unlike the quotations in spot market which contains immediate delivery (within two days), some banks quote their exchange rates with longer delivery. That is to say, two parties agree to exchange their currencies at a specific date in future but with a rate that is presently agreed. Reuters Financial Training (1999) defines currency future contracts as follows:

> These are forward transactions with standard contract sizes and maturity dates which are traded on a formal exchange. The contract is a binding obligation to buy or sell one currency against another at an agreed rate of exchange for a future delivery date (p.93).

Exporters and importers can use currency futures to hedge their foreign exchange risk exposure. Let us presume an American exporter who receives 100,000.00 CAD in two months. The exporter can sell the same amount of export revenue in terms of USD with two months maturity. So, the export revenue is locked in the agreed exchange rate no matter what is direction of the exchange rate fluctuations within these two months.

Usually, currency futures or foreign exchange future contracts are quoted in terms of U.S. dollar. Once someone enters into a FX future contract, he made himself officially obliged to deliver the sold currency and receive the bought currency at maturity date.

The deals are fulfilled through an official exchange. The most famous exchanges that quote future exchange rates are Marché á Terme International de France and Chicago Mercantile Exchange.

Foreign exchange forward contract is similar to FX future contract that has been explained above. The only difference is, the future market is standardized whereas forward contracts are traded over the counter. Two parties, under a foreign exchange forward contract, agree a specific rate for exchanging their currencies at a specific date in future. Hence, there is always the counterparty risk in forward contracts. Unlike the future contracts that are settled via clearing house and require initial margin, the forward contracts are settled by the contracting parties without requirement for any initial margin. According to Melvin (2004), "the forward exchange market refers to buying and selling currencies to be delivered at a future date" (p.70). The forward exchange rate might be either more or less than the spot rate.

The forward exchange rate is directly related to the considerations of the offerer as to the future circumstances however the forward rate is not just an estimation of the spot exchange rate in future. The inequality between the spot rate and the forward rate in foreign exchange market is called forward premium or discount. Such inequality is due to difference in interest rates of the two currencies. Melvin (2004) states:

> If the forward exchange price of currency exceeds the current spot price, that currency is said to be selling at a forward premium. A currency is selling at a forward discount when the forward rate is less than the current spot rate. In the event that the spot and forward rates are equal, the currency is said to be flat (p.71).

Foreign exchange forward contract is also called outright forward transaction. It is a none-negotiable deal between a bank and its customer. Forward exchange rates are quoted with maturity of one, two, three, six, and twelve months. Nonetheless, if clients demand a maturity except the said maturities, the bank may offer them. This rate is known as a broken date rate. The following table is a sample of quotation for forward exchange rates.

Table 3.1: The New York Foreign Exchange Rate Quoted at 16:00 ET on January 31, 2003

Country (Currency)	**U.S. $ equivalent**	**Currency per U.S. $**
Australia (Dollar)	0.5875	1.7021
Britain (Pound)	1.6472	0.6071
1 Month Forward	1.6438	0.6083
3 Months Forward	1.6365	0.6111
6 Months Forward	1.6268	0.6147
Canada (Dollar)	0.6572	1.5216
1 Month Forward	0.6564	1.5232
3 Months Forward	0.6545	1.5279
6 Months Forward	0.6514	1.5352
Japan (Yen)	0.008341	119.89
1 Month Forward	0.008349	119.77
3 Months Forward	0.008369	119.49
6 Months Forward	0.008396	119.10
New Zealand (Dollar)	0.5448	1.8355
Switzerland (Franc)	0.7332	1.3639

1 Month Forward	0.7336	1.3631
3 Months Forward	0.7346	1.3613
6 Months Forward	0.7360	1.3587

Source: Melvin, M. (2004). International Money and Finance (7th ed.). Boston: Pearson.

For computing the forward rate, forward points should be added to or deducted from the spot rate. In case of forward premium, the points have been added and in case of forward discount, the points have been subtracted from the spot exchange rate.

International traders of goods and services frequently utilize the FX forward contracts to cover their currency risk. For instance, an American importer, who has payables in GBP in next month, can lock himself in a one month forward contract on GBP/USD so that he pays the import contract amount to the British exporter in GBP according to the rate that he has already agreed on the forward contract (no matter how the exchange rate moves during this period).

Suppose that the current spot rate for GBP/USD is 1.85 and the American importer has gotten a FX one month forward contract on the same currency pair for 1.87. Thus, the importer is hedged against currency risk of any increase in the exchange rate above 1.87 for his import contract. This example shows that the importer tolerates the increase in the exchange rate from 1.85 to 1.87 but is insured for any increase that causes the exchange rate to exceed 1.87.

3.4.4 Foreign Exchange Options

Foreign exchange option or FX option contract is a type of contract that allows the holder to buy or sell the currencies in future at a pre-determined rate. In other word, it

provides the possibility of trading the currencies in future. Bodie et al. (2009) state: "a currency option offers the right to buy or sell a quantity of foreign currency for a specified amount of domestic currency" (p.677). Option contracts that provide buying possibility are called call contracts while the contracts that provide selling possibility are called put contracts. For instance, one can buy call options that enable him to purchase 2,000.00 Euro in terms of USD in next two months at Euro/USD exchange rate of 1.36. According to Bodie et al. (2009), "a call option gives its holder the right to purchase an asset for a specified price, called the exercise, or strike, price, on or before some specified expiration date" (p.672). On the other hand, a person can buy put contracts in order to sell the same amount of Euro in terms of USD with the same exercise price in future. Bodie et al. (2009) state "A put option gives its holder the right to sell an asset for a specified exercise or strike price on or before some expiration date" (p.673).

When we believe that a currency will appreciate in future, we can buy call option on that currency to take advantage of its higher rate in future. This type of foreign exchange traders is called bullish. However, the bearish traders in foreign exchange market, who anticipate that value of a currency will fall in future, are able to buy put options in order to take advantage from depreciation of that currency. Once, someone buys any call or put option contract, he technically goes long on that option. In option market, it is also possible to sell (write) call and put options. In this case, we go short on that option contract. Unlike the long position under which we should pay premium, short position supplies us the premium that is paid by holder of the contract. The following graphs depict the potential gain or loss under long call, long put, short call, and short put positions comparing to simple buy and sell of the underlying.

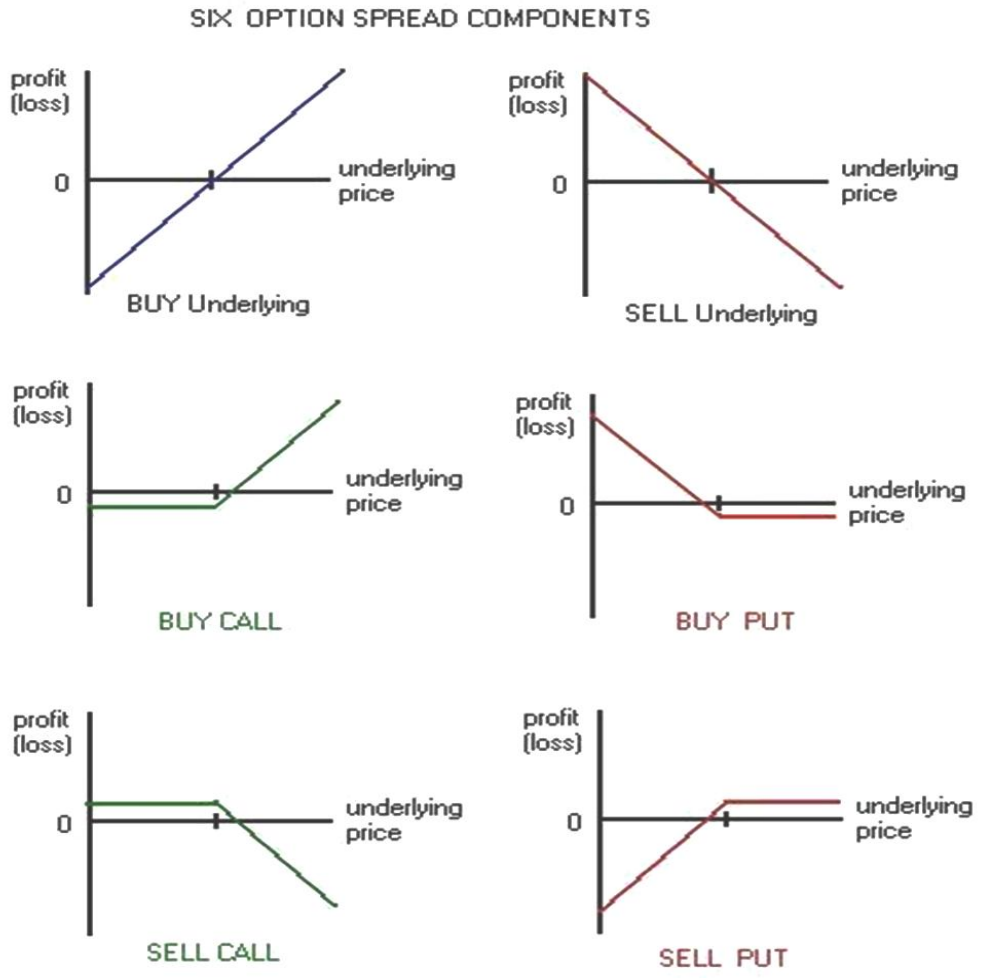

Figure 3.1: Potential Gain or Loss under Option Contracts

Source: http://www.fundamentalfinance.com/options/options-basic-charts.php

According to the above graphs, a person who goes long on call option can benefit from increasing the price of underlying asset but is exposed to no loss if price of the underlying falls (disregarding the premium). Holder of a put option can reversely benefit from decreasing the price of underlying but is exposed to no loss if value of the underlying rises. Holders of both put and call options are supposed to pay the relevant premiums.

A person who goes short on call or put option benefits from premium that he receives from the option holder. Writer of call option is exposed to unlimited loss if price of the underlying goes up because the call option holder exercises the contract. If price of the underlying decreases or remain unchanged, the call writer will not bear any loss since the contract will remain unexercised. On the other hand, a person who goes short on put option is exposed to unlimited losses if value of the underlying falls but is safe if price of the underlying goes up or at least remain unchanged.

Foreign exchange options are standardized derivatives that are quoted by some exchanges, banks, and brokers. Same as the spot market, the quotations are offered through bid and ask prices. The quotations are given for a specific time namely contract period. There are two types of option contracts. European and American styles. The holders of American style options are able to exercise the option contract at any time before maturity or end of the contract period while those of European style options can only exercise the contract on maturity. As a matter of fact, holders of the American style options have also the advantage of benefiting from favorable movements of the exchange rate during the contract period. Instead, holders of European style options have the advantage of paying cheaper premiums.

The exchange rate at which the foreign exchange option holders can exercise their contracts is called strike price. Each option is quoted with different alternatives of strike price. If the strike price is equal to the current exchange rate, the option is at the money. In the case of call options, if it is more than the current exchange rate, the option is in the money and if it is less than the current exchange rate, the option is out of the money.

In the case of put options, the contract is in the money and out of the money if the strike price is respectively less and more than the current exchange rate.

Generally, disregarding premium, in the money option is an option that produces benefit if it is exercised at the moment whereas out of the money option is an option that produces loss if it is exercised at the moment. Finally, at the money option means that exercise of the contract at present time does not provide any loss or gain for the option holder.

Option contracts can be traded for either speculation or hedging purposes. The main advantage of using option contracts for speculators is that by a small amount of investment, they can benefit from movements in price of the underlying without any need to buy it. Moreover, when an investor possesses the underlying, he can long put on the relevant option contract to be hedged against potential loss resulting from decline in price of the underlying. It is named protective put. The point for option contracts is that the holder, unlike the future and forward contracts, is not obliged to exercise the contract but can do so only when he finds it beneficial.

Firms, especially exporters and importers of goods and services can also use the foreign exchange options as insurance for covering the currency risk during their import or export period. Ehrlich and Anandarajan (2008) state: “By using foreign exchange options, a U.S. company can establish the right but not the obligation to purchase a fixed amount of foreign exchange at a fixed rate at some date in the future” (p. 5).

As an example, assuming the current Euro/USD exchange rate of 1.44, a German exporter who has two months receivables in USD can purchase American style FX put options on USD in terms of Euro with the purpose of being hedged from depreciation of USD against Euro within coming two months. Therefore, in case of depreciation of USD within these two months, there will be a trade-off between the losses on export contract and the gains on long put options. If the exporter is able to afford the devaluation of USD against Euro up for a certain level and wants to be hedged for further devaluation of USD, he may purchase the put options with higher strike price such as 1.46. Instead, he pays less money as premium that makes the insurance less expensive for him. As a result, any loss from increasing the exchange rate from 1.44 to 1.46 is borne by the exporter but he is insured for any further loss from that point (increasing the exchange rate above 1.46).

In view of the fact that foreign exchange option contracts are quoted with different strike prices and maturities, foreign exchange options provide various hedging strategies with different protection levels for importers and exporters to be insured from currency risk. More currency hedging strategies for international traders with the use of FX options are discussed in the next chapter.

Chapter 4

EMPIRICAL ANALYSIS: CASE STUDY OF CANADIAN DOLLAR OPTION CONTRACTS ON U.S. DOLLAR (USX)

The previous chapter focused on the concept of hedging for international traders and the various hedging instruments they can use in order to alleviate the foreign exchange risk. This chapter concentrates on foreign exchange option contract since it provides the traders with various alternatives for hedging their foreign exchange risk as per their requirements. Foreign exchange forward and future contracts are disregarded due to lack of data. The chapter aims to analyze efficiency of the option contracts, specifically targeting Canadian importers and exporters who deal with American Dollar during 2010. For this purpose, this chapter gives a brief explanation concerning the trade background between USA and Canada. Accordingly, the gathered data will be described, the analysis will be done. Finally, the results will be separately illustrated and argued for each item of our case study.

4.1 Trade between Canada and USA

Trade between USA and Canada refers to early era of foundation of two countries. These two countries had always very close relationship in terms of economy, military issues, and culture. The most important reasons for bilateral trade relationship between Canada and USA are their specific geographical locations and existence of mutual law enforcements.

According to the website of Foreign Affairs and International Trades of Canada, since 1987, they have entered into a mutual trade arrangement namely FTA or free trade agreement. This was with the aim of reducing trade barriers, encouraging producers to have a fair competition, and facilitating transportation between two countries. Such agreement augmented the level of trade between USA and Canada dramatically. (http://www.international.gc.ca/trade-agreements-accords-commerciaux/agr-acc/fast-facts-US.aspx?lang=en&view=d). As the empirical analysis covers year 2010 only, it is crucial to know the volume of bilateral trade during the said year. According to the U.S. Department of Commerce, USA has imported 277,647.5 million USD from and exported, 105.00 million USD to Canada during 2010 as follow. [2]

Table 4.1: U.S. Trade in Goods and Services with Canada (2010)

Month	Exports	Imports	Balance
January 2010	17,226.5	21,653.8	-4,427.3
February 2010	18,540.4	21,233.1	-2,692.6
March 2010	22,184.4	24,316.3	-2,131.9
April 2010	20,962.6	23,656.7	-2,694.1
May 2010	21,366.6	23,658.1	-2,291.5
June 2010	22,341.9	24,771.8	-2,429.9
July 2010	19,633.1	21,294.9	-1,661.8
August 2010	21,210.3	23,452.4	-2,242.2
September 2010	21,784.1	23,028.5	-1,244.4
October 2010	22,148.2	23,440.6	-1,292.4
November 2010	21,054.6	22,902.0	-1,847.5
December 2010	20,652.3	24,239.2	-3,586.9
TOTAL 2010	**249,105.0**	**277,647.5**	**-28,542.5**

Note: All figures are in millions of U.S. dollars on a nominal basis, not seasonally adjusted

[2]http://www.census.gov/foreign-trade/balance/c1220.html

In such high trade volume, it is vital for traders to consider the foreign exchange risk; otherwise they might bear big losses. Thus, in this thesis, the effectiveness of option contracts, which is one of the most important hedging instruments in this respect, is assessed.

4.2 Data

Data of the study is divided into two sections. First, the exchange rates between USD and CAD during 2010 & 2011 and second, the premiums for call and put options during 2010. These have been extracted from different sources and need to be interpreted in accordance with instructions of the bidders. The below sub-sections point out the details regarding each of them.

4.2.1 Exchange Rate between USD and CAD during 2010 and 2011

In order to understand whether the hedging strategies using the option contracts work well or not, we should compare the situation where that strategy is applied with the situation where the business is left unhedged. For this purpose, we need to have the exchange rates of commencing and ending times of hedging period. The USD/CAD rates have been extracted from website of OANDA[3]. This company is a broker for internet based traders of foreign exchange over the world and is located in Canada, Singapore, Japan, Dubai, and United Kingdom. OANDA is one of the most reliable sources of historical exchange rates and provides several financial services to both individual and companies.

The exchange rates are quoted as USD/CAD which means value of one U.S. dollar in terms of Canadian dollar. For instance, on 6th Jan 2010, the bid and ask rates were

[3] http://www.oanda.com

1.03867 and1.0390 respectively meaning that an individual was supposed to pay 103,900CAD in order to receive 100,000USD. Similarly for selling 100,000USDhe was supposed to receive 103,867CAD.

As the thesis covers the hedging for both importers and exporters, one cannot use the same quotation in both cases. Ask quotation should be used for the case of Canadian importers because importers need to provide the required amounts of money in currency of exporter's country to fulfill their payment obligation. However, for the case of Canadian exporters, the bid quotation should be used since exporters wish to exchange their proceeds (which is in this case in USD currency) to their own currency (i.e., Canadian Dollar).

4.2.2 Premiums for Call and Put Options During 2010

As our analysis uses the option contracts, the relevant premiums need to be considered in the required computations. The source of data in this regard is the website of the Montreal Exchange (MX) which is the official trade mark of "la Bourse de Montréal". MX is the oldest exchange in Canada and solely concentrates on derivative products. MX offers equity options, shares future contracts, currency options, index derivatives, and interest rate derivatives. MX is highly reputed for its accurate and on time settlements since all clearings are done through Canadian Derivatives Clearing Corporation that provides central counterparty clearing service to traders. The premiums needed for the analysis, were extracted from the historical data base of this official website. The details of the option contracts are as follow in table 4.2

Table 4.2: USX Option

Underlying	**USD/CAD**
Trading Unit	US$10,000
Strike Prices	Strike prices are expressed in cents per units of foreign currency. For example, 120.50 cents Canadian is equivalent to C$1.2050
Strike Price Interval	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.
Minimum Price Fluctuation (Tick Size):	The minimum price fluctuation of the premium is 0.01 cent Canadian or a tick value of C$1 per unit of foreign currency. That is: 0.01 cent Canadian/US$ 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.
Contract Months	The first three months plus the next two quarterly months in the March, June, September, December cycle
Expiration Date	At 12:00 p.m. (Montréal time) on the third Friday of the expiration contract month
Reporting Limit	500 contracts on the same side of the market in all contract months combined.
Position Limits	Information on position limits is subject to periodic changes and can be obtained from the Exchange (see Circulars).
Minimum Margin Requirement	Information on minimum margin requirements is subject to periodic changes and can be obtained from the Exchange (see Circulars).
Trading Hours	9:30 a.m. to 4:00 p.m.(Montréal time)

Source: http://www.m-x.ca/produits_options_devises_en.php

As stated in the table above, the option premiums are calculated as follow. For example, a premium quotation of 0.75 cents Canadian for an option on the US dollar represents an

aggregate premium value of 0.75 cents Canadian/US$ x US$10,000 x C$1/100 cents Canadian = C$75.

4.3 Methodology and scope of analysis

In the absence of foreign exchange hedging, if USD/CAD exchange rate drops during the period between the date of commencing the contract and the date of effecting payments, the Canadian exporters will bear losses due to the fact that the received proceeds from export revenues, which are in USD, will be less in terms of CAD. On the contrary, any increase in USD/CAD rate during the aforesaid period of time increases the Canadian exporters' revenue as they can change their USD to CAD at a higher rate. The situation for the Canadian importers would be exactly the opposite of Canadian exporters. That is to say increasing and decreasing USD/CAD rate will be respectively harmful and beneficial for importers.

The research studies three types of hedging strategies by using option contracts on USD targeting Canadian exporters and importers who deal with US dollar. Microsoft Excel software is used for the analysis.

Such hedging is aimed at avoiding losses arise due to adverse movements of the exchange rate and locking the amount to be received (case of exporters) or paid (case of importers) at the date of payment. In fact, the hedged position is compared with the unhedged position in terms of net values received at the end of the contract.

It is assumed that the amount of trade is 10,000.00 USD and the payment is effected against the delivery of relevant goods or services for five alternative periods: 9 to 16

days or 38 to 46 days or 70 to 77 days or 101 to 165 days or 192 to 265 days. The study assumes that the hedging periods start from 5^{th} or 6^{th} or 7^{th} of each month during 2010. Another assumption is that all option contracts are traded at the money as it provides complete hedging. It is also supposed that payment is effected by the importer in accordance with the USD/CAD exchange rate at the date of delivering the contractual goods or services.

The study focuses solely on foreign exchange option contracts as hedging instrument because options give the traders unlimited alternatives for hedging so that each trader can choose a particular option contract (with specific expiry date and exercise price) that meets his requirements. By FX options, the traders can also impose a desirable limitation for potential losses. Such market is the most liquid market in the word and the investors or hedgers can enter the market only with a couple of hundred dollars.

Nonetheless, the limitation of the study is that the analyses do not cover the FX forward / future derivatives as alternative hedging instrument. It would be a more comprehensive study if the forward / future contracts were also included in the analyses but the data in this respect was not available. Furthermore, the results of the analyses are only valid for the period investigated (year 2010).

4.3.1 FX Options as Hedging Instrument for Canadian Exporters

As the first hedging strategy for Canadian exporters, in the primary step, the value of foreign exchange gain or loss for exporting 10,000.00USD goods or services from Canada to USA (unhedged position) is computed from the view point of the Canadian exporter. For this purpose, the assumed export value (10,000.00USD) multiplied by

USD/CAD exchange rate at the date of commencing the contract, is compared with the export value multiplied by the exchange rate at the date of effecting payments by the American importer. In the next step, the export value in CAD currency is determined as per the exchange rate at the payment date with the aim of realizing the amount that the exporter receives in the absence of any FX hedging.

Now, the analysis intends to compare the hedged versus unhedged position for the exporter. So, such hedging strategy considers that the exporter buys put options on USD (long position) to be hedged against potential FX losses resulting from depreciation of USD or in other words, appreciation of CAD.

According to this hedging strategy, if the value of USD depreciates against CAD by the time of effecting payment, exporter will lose on the export contract, but such loss will be compensated by the gain on put options. If the value of USD appreciates against CAD in the same period, he will gain on export contract but the put options will remain unexercised. In either case, the exporter needs to bear the costs of premium for going into long put position (disregarding the transaction costs). In the following step, any gain or loss resulting from the purchased put options is calculated. Then, by subtracting the premiums from the calculated gain or loss in the last step, net gain or loss from long put option is determined. Eventually, by adding this amount to the amount of final value of unhedged position, the final value of hedged position is determined. At the end, by comparing the value of hedged versus unhedged position, we try to find out whether this hedging strategy was fruitful for the exporter or not.

Suppose the USD/CAD at the commencing date of an export contract is 1.22 and it drops to 1.03 by the time the U.S. importer pays the contractual amount of 10,000.00 USD to the Canadian exporter. It implies that the Canadian exporter lose equal to 1,900.00 CAD when receives the export revenue at payment date (12,200.00 – 10,300.00). So, by this strategy, the Canadian exporter purchases two put options on USX to prevent losing due to depreciation of USD during the contract period. Presume the price of each at the money put option is 500.00 CAD. The importer's cost, for purchasing the required options, is 1,000.00 CAD (500.00 x 2). As the exchange rate drops during this period, the purchased put options totally yield 3800.00 CAD (1900.00 x 2). By subtraction of relevant cost of 1000.00 CAD, the net gain under the option contracts is 2,800.00 CAD. On the other hand he lost 1900.00 CAD under export contract. Therefore, not only the Canadian exporter in our example avoided the negative effect of devaluation of USD, but also increased his total portfolio value for 900.00 CAD (2800.00 -1900.00). Briefly, under the unhedged position, the exporter receives 10,300.000 CAD whereas under the hedged position he receives 13,100.00 CAD.

Although the analysis considers the export value of USD 10,000.00 and on the other hand option premiums in Montreal Exchange are quoted in cents Canadian per unit of foreign currency (i.e. each option contract is for exchange of USD 10,000.00 to CAD 10,000.00), the exporter in this strategy is supposed to buy 2 put options and not one. That is due to the fact that all options in this study are traded on at the money basis and delta of at the money options is 0.5.Option delta is defined as follow.

> "Option Delta is the change in the price of an option for a one point moves in the underlying. The delta of Call options is between zero and one whereas that of Put options is between minus one and zero. Delta of in-the-money options

> approaches one (call:+1,put:-1). For at-the-money options, it is about 0.5 (call:+0.5, put: -0.5) and finally for out-of-the-money options, it approaches zero. Call Option Delta can be interpreted as the probability that the option will finish in the money. An at-the-money option, which has a delta of approximately 0.5, has roughly a 50/50 chance of ending up in-the-money. Put Option Delta can be interpreted as -1 times the probability that the option will finish in the money."[4]

Referring to our example, the hedging would be almost useless if the Canadian exporter purchased only one put option because he would gain only 1,400.00 CAD under the option contract (1900.00 – 500.00). Hence, as he has lost equal to 1,900.00 CAD under the export contract, he would totally lose 500.00 CAD (1,900.00 – 1,400.00).

As the second hedging strategy for Canadian exporters, similar to the first strategy, the foreign exchange gain/loss on export contract as well as the final value of unhedged position (according to the exchange rate on the payment date) are calculated. However, this time the exporters go short in call options. It means call options on US dollar are sold with the exercise price equal to exchange rate of date of commencing export contract. In this case, whenever the USD/CAD exchange rate increases (devaluation of CAD and appreciation of USD), the exporter gains some extra profit on the export contract as a result of such exchange rate movement. Nevertheless, the holder of the call option will exercise the option contract and hence, there will be a balance between loss on sold option contract and gain on export contract. Conversely, if the exchange rate decreases (appreciation of CAD and depreciation of USD), the holder of the call option will not use its right to exercise it. The exporter will also lose on the export contract but instead he received premium for selling the call options. Again same as the first strategy,

[4]http://www.trader-soft.com/option-trading/option-advanced/option-delta.html

here the exporter needs to short 2 call options because he shorts such option at the money and the delta of at the money call options is 0.5.

Considering the same example, the Canadian exporter again loses 1,900.00 CAD under the export contract due to reduction of the exchange rate from 1.22 to 1.03. However, this time he sells call options instead of buying put options for hedging his foreign exchange risk. Suppose that the value of shorting each at the money call option on USX is 950.00 CAD. Thus, the exporter receives 1,900.00 CAD (950.00 x 2) as the premium for the sold call options that exactly covers the loss under the export contract. Meanwhile, the call options remain unexercised since USD has not been appreciated during this period. (Even if USD has appreciated within such period, any loss from exercising the call options by options holder would be compensated by gain on export contract for the same value).

According to this strategy, the exporter is completely hedged if USD appreciates but in case USD deprecates, the hedging level is only equal to the amount he received as premium from call option holder. In other word, if the latter is the case, the exporter is hedged as long as the increase in value of CAD does not cause the received premiums to be less than the losses on the export contract. Unlike the first strategy, the second strategy can be deemed as a partial hedging which only alleviates the foreign exchange risk and does not eliminate it entirely. That is to say, the more expensive the exporter sells the call options, the higher level of hedging he obtained on his export contract.

Finally, as the third hedging strategy, exporter goes long on the put and short on the call positions for USX (USD options) simultaneously. The foreign exchange gain/loss on export contract as well as the final value of unhedged position should be computed. Then net gain/loss on each option position is calculated and eventually like the previous strategies, the hedged position is compared with the unhedged position. This strategy is called synthetic hedging as there is a combination of both call and put options. According to this hedging strategy, if by the payment time USD appreciates against CAD (e.g., moving from 1.2 to 1.3); the exporter will gain on either export contract or the received premium on sold call options. However he will lose on the sold call option as its holder will exercise it and the purchased put options will remain unexercised. Conversely, if USD depreciates during the aforementioned period, the exporter will lose on the export contract but will gain on the purchased put option. Also he has received a premium on the sold call options which will remain unexercised.

Unlike the two previous hedging strategies, in the synthetic position, one put option and one call option are traded at the same time. The synthetic position grants the exporter the rights to achieve insurance at a lower cost and to reduce losses arise from adverse movements of the exchange rate.

Consider the same example as mentioned above for the first and second strategy. This time, the exporter, for hedging purpose, goes long on one at the money put option with price of 500.00 CAD and short on one at the money call option with price of 950.00 CAD at the same time. As the exchange rate decreases, the put option is exercised but the call option is not exercised. Net gain from the purchased put option is 1,400.00 CAD

(1900.00 – 500.00) and the net gain on the sold call option is 950.00 CAD (equal to received premium). Although the exporter has lost 1,900.00 CAD on the export contract, totally he has gained. It means the depreciation of USD didn't cause any loss for the exporter with this strategy and he even gained equal to 450.00 CAD (1,400.00 + 950.00 – 1,900.00). The difference between hedged and unhedged position in this example is 2,350.00 CAD (the hedged position yields positive 450.00 CAD whereas the unhedged position yields to minus 1,900.00 CAD).

4.3.2 FX Options as Hedging Instrument for Canadian Importers

It is assumed that the condition is same as what it was in the previous part for the exporter with the exception that the Canadian trader is importing goods and services (for the same value) from his American business partner. The difference between exporters and importers in foreign exchange hedging is that an exporter hedges the amount he will receive at the time of payment into his own currency while an importer should make the payment value at the payment date equal to what he was supposed to pay when he entered into the import contract (time of signing or commencing the import contract)

As the first hedging strategy for Canadian importers who intends to import 10,000.00 USD from USA, two call options on USX are bought so that in case of adverse USD/CAD fluctuation, any loss on import contract will be traded off by the gain on the purchased options. As in other strategies discussed so far, the premium that importer pays to obtain the call options is deemed as the hedging or insurance costs. In this regard, if USD depreciates by the payment time, the purchased call options will remain unexercised but the loss of incurred premium is compensated by the gain on the import contract. At the end, hedged versus unhedged position of the importer is compared.

As the second strategy, two put options on USX are sold by the importer. This strategy looks like the second strategy for Canadian exporters but in reverse position. This also does provide a partial hedging (up to a certain level). It implies that if USD appreciates, the importer is hedged as long as the foreign exchange loss on import contract does not exceed the amount of received premium for shorting call options. Lastly, a comparison of the hedged and unhedged positions is carried out.

The third and the last hedging strategy for Canadian importers is the synthetic hedging in which one call and one put option on USX are bought and sold respectively at the same time and with at the money exercise price. Thus, any increase in value of USD causes the importer to bear loss on import contract but gain on the purchased call option. In this scenario, the sold put option will remain unexercised. Oppositely, any decrease in the value of USD leads to gain on import contract but loss on the sold put option while the purchased call option will remain unexercised.

In order to illustrate the potential gain or loss possibilities for each of these three strategies that constitute the foreign exchange hedging for Canadian importers and exporters, hereunder an example of hedging is given. The current USD/CAD rate is presumed 1.2 and the future rate is presumed either 1.1 or 1.3.

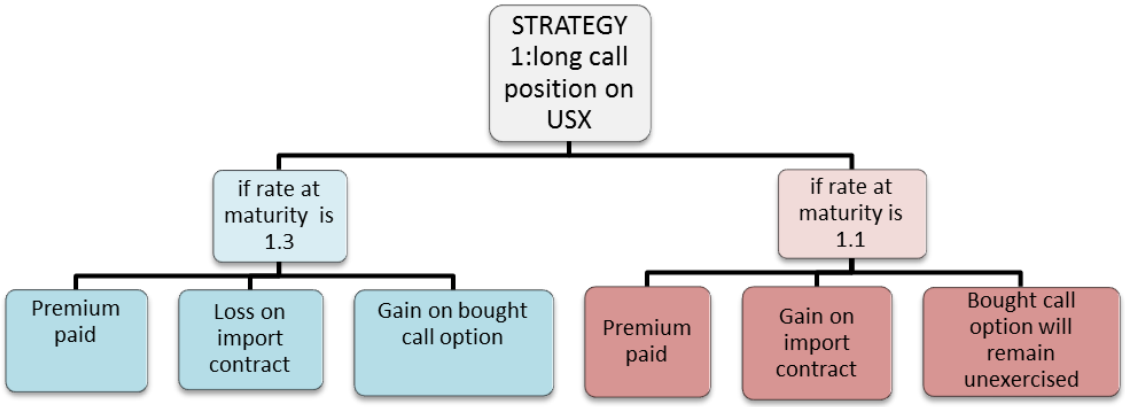

Figure 4.1: First Hedging Strategy for Importers

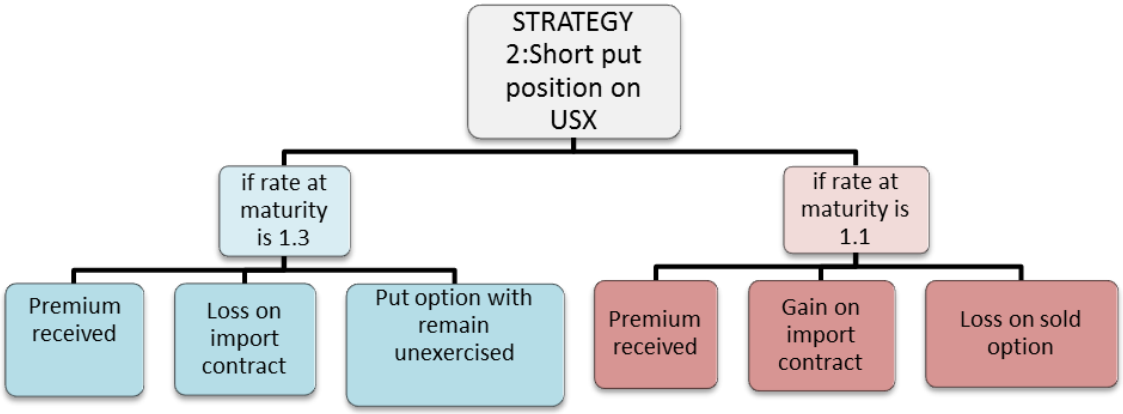

Figure 4.2: Second Hedging Strategy for Importers

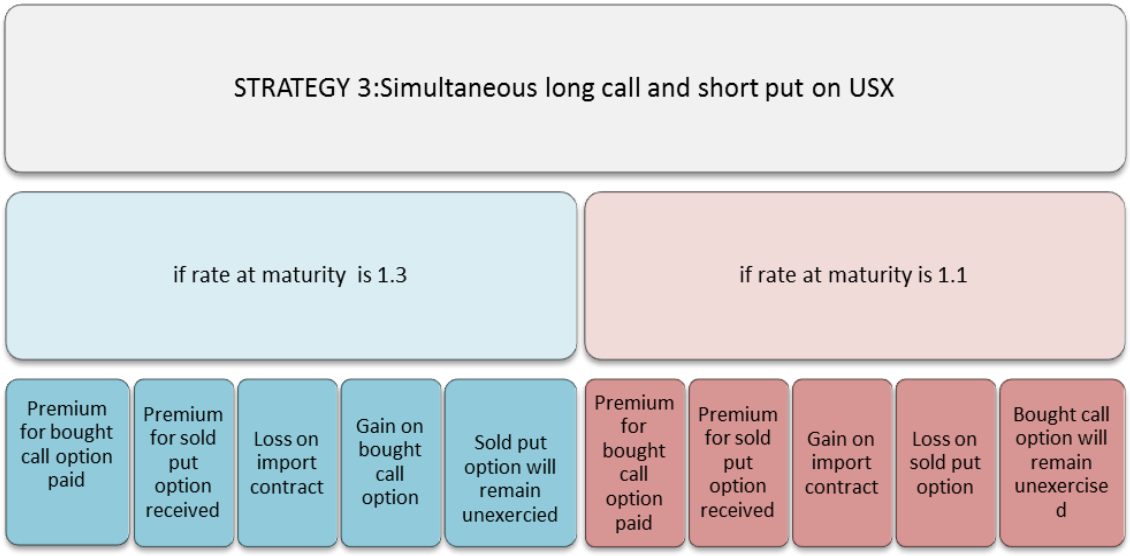

Figure 4.3: Third Hedging Strategy for Importers

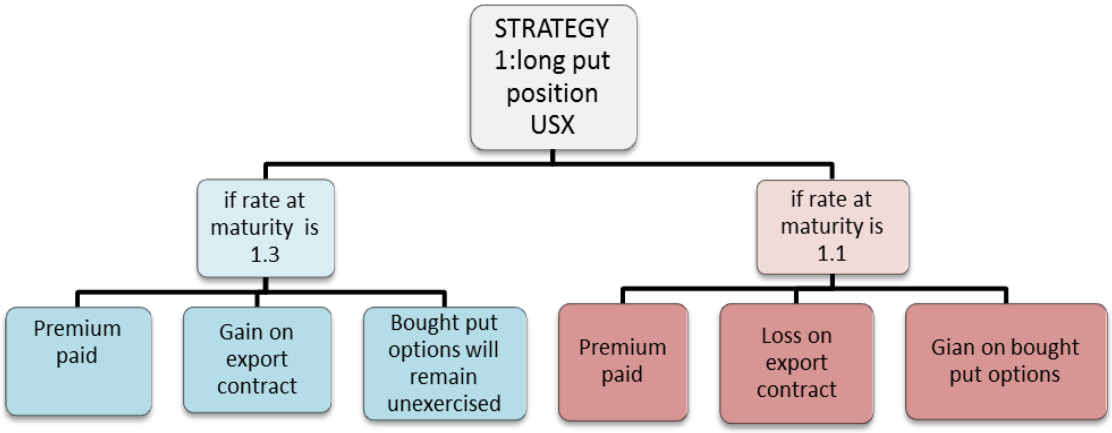

Figure 4.4: First Hedging Strategy for Exporters

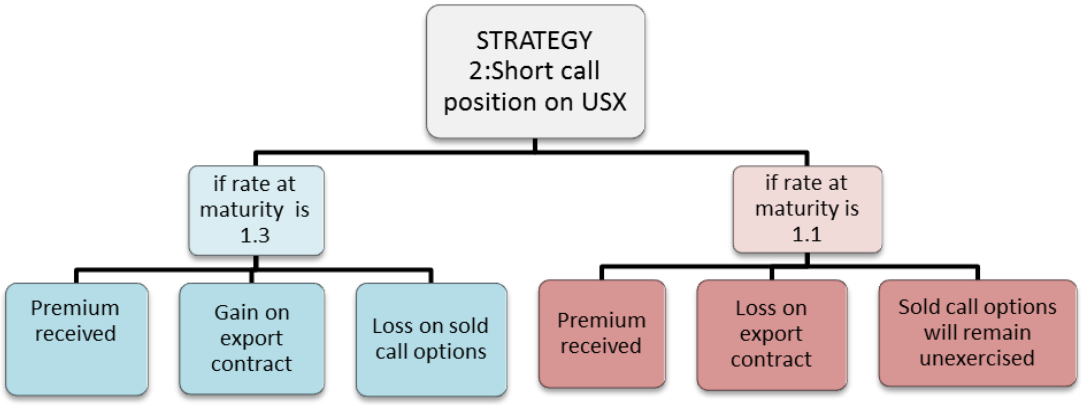

Figure 4.5: Second Hedging Strategy for Exporters

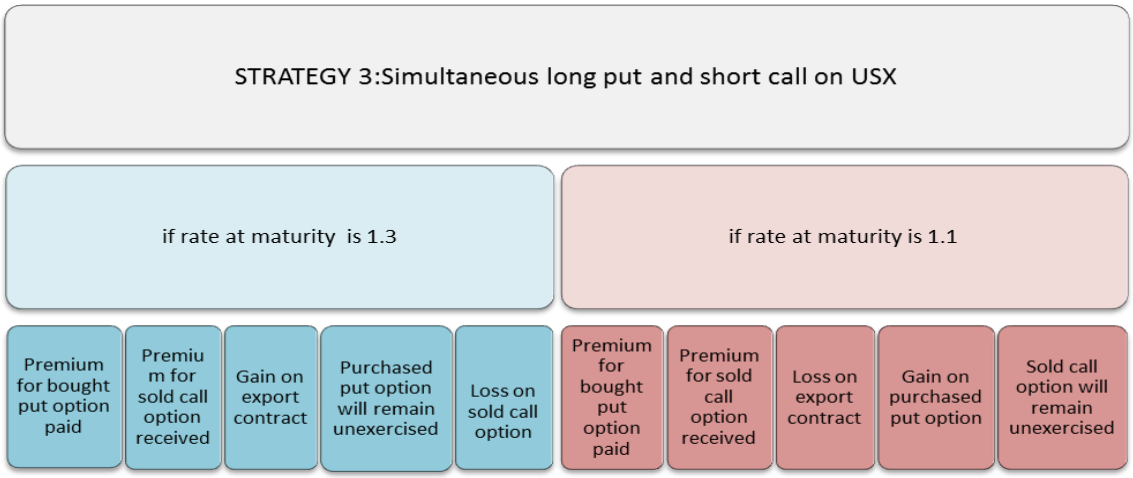

Figure 4.6: Third Hedging Strategy for Exporters

4.4. Empirical Results

In this section, the tables of analysis for each hedging strategy are provided and consequently, the results for each strategy are discussed for our period.

4.4.1 Comparing Hedged and Unhedged Positions: Canadian Exporters

Hereunder, results of the three analysis tables related to the first, second, and third strategies of foreign exchange hedging for Canadian exporters are illustrated:

4.4.1.1 First Strategy: Long Put Options on USX with at the Money Exercise Price

According to the first item of the following table, a Canadian trader who, without some hedging, signed an export contract of 10,000.00 USD with 9 days duration on 06.01.2010 was supposed to receive equal to 10,294.00 CAD as per the exchange rate on 15.01.2010. If that exporter had used two long put options as foreign exchange hedging, his total revenue (including costs of purchasing the option contracts), would have been reduced to 10,232.00CAD. Likewise, the total revenue would have been reduced for the export contracts with 44 days or 72 days or 163 days or 254 days duration on the same date.

However, this strategy, has increased the total revenue of the same export contract concluded in Feb 2010 for some specific export durations (let's say durations of 14, 42, 70, and 103 days). Generally in 2010, this was not a very efficient foreign exchange strategy. As a matter of fact, among 60 items in the table, this strategy worked cost-effectively only for 17 items (mostly in February, March, and September). It implies that the hedging strategy performed better than the unhedged position in 28.3% cases during 2010. In 47 items out of 60 items, the value of U.S. dollar has depreciated against Canadian dollar and the trader has exercised the bought put options. Nonetheless, the hedging strategy did not allow the total portfolio of the exporter to be increased or even be stabilized in most cases. The most efficient case is the 8^{th} item and the worst case is the 5^{th} item under which the total portfolio of the exporter has increased and decreased for 870CAD and 828 CAD respectively.

This hedging strategy for exporters acts like protective put strategy in stock market for stock holders who purchase put option on the underlying security in order to be protected against potential loss due to fall in price of the same stock.

Table 4.3: First Hedging Strategy for Canadian Exporters

Item	First Date	USD / CAD on First Date	Last Date	USD / CAD on Last Date	Duration (Days)	Foreign Exchange Gain/Loss on Export Contract (Unhedged Position)	**Final value (unhedged position as per rate on last date)**	Premium for each Put Contract on USX	Number of required Put	Gain/Loss from Long Put Options	Net Gain / Loss from Long Put Options	**Final Value (Hedged Position)**	**Comparison**
1	06/01/20	1.039	15/01/20	1.0294	9	-96	10,294	127	2	192	-62	10,232	Unhedged
2	06/01/20	1.039	19/02/20	1.0452	44	62	10,452	222	2	Unexercise	-444	10,008	Unhedged
3	06/01/20	1.039	19/03/20	1.0123	72	-267	10,123	285	2	534	-36	10,087	Unhedged
4	06/01/20	1.039	18/06/20	1.0273	163	-117	10,273	429	2	234	-624	9,649	Unhedged
5	06/01/20	1.039	17/09/20	1.0269	254	-121	10,269	535	2	242	-828	9,441	Unhedged
6	05/02/20	1.064	19/02/20	1.0452	14	-195	10,452	75	2	390	240	10,692	Hedged
7	05/02/20	1.064	19/03/20	1.0123	42	-524	10,123	155	2	1048	738	10,861	Hedged
8	05/02/20	1.064	16/04/20	0.9997	70	-650	9,997	215	2	1300	870	10,867	Hedged
9	05/02/20	1.064	18/06/20	1.0273	133	-374	10,273	325	2	748	98	10,371	Hedged
10	05/02/20	1.064	17/09/20	1.0269	224	-378	10,269	430	2	756	-104	10,165	Unhedged
11	05/03/20	1.031	19/03/20	1.0123	14	-191	10,123	95	2	382	192	10,315	Hedged
12	05/03/20	1.031	16/04/20	0.9997	42	-317	9,997	155	2	634	324	10,321	Hedged
13	05/03/20	1.031	21/05/20	1.0598	77	284	10,598	215	2	Unexercise	-430	10,168	Unhedged
14	05/03/20	1.031	18/06/20	1.0273	105	-41	10,273	265	2	82	-448	9,825	Unhedged
15	05/03/20	1.031	17/09/20	1.0269	196	-45	10,269	370	2	90	-650	9,619	Unhedged
16	05/04/20	1.011	16/04/20	0.9997	11	-119	9,997	135	2	238	-32	9,965	Unhedged
17	05/04/20	1.011	21/05/20	1.0598	46	482	10,598	200	2	Unexercise	-400	10,198	Unhedged
18	05/04/20	1.011	18/06/20	1.0273	74	157	10,273	240	2	Unexercise	-480	9,793	Unhedged
19	05/04/20	1.011	17/09/20	1.0269	165	153	10,269	345	2	Unexercise	-690	9,579	Unhedged
20	05/04/20	1.011	17/12/20	1.0051	256	-65	10,051	410	2	130	-690	9,361	Unhedged
21	05/05/20	1.019	21/05/20	1.0598	16	407	10,598	90	2	Unexercise	-180	10,418	Unhedged
22	05/05/20	1.019	18/06/20	1.0273	44	82	10,273	150	2	Unexercise	-300	9,973	Unhedged
23	05/05/20	1.019	16/07/20	1.0361	72	170	10,361	195	2	Unexercise	-390	9,971	Unhedged
24	05/05/20	1.019	17/09/20	1.0269	135	78	10,269	280	2	Unexercise	-560	9,709	Unhedged
25	05/05/20	1.019	17/12/20	1.0051	226	-140	10,051	365	2	280	-450	9,601	Unhedged

26	07/06/20	1.063	18/06/20	1.0273	11	-358	10,273	205	2	716	306	10,579	Hedged
27	07/06/20	1.063	16/07/20	1.0361	39	-270	10,361	280	2	540	-20	10,341	Unhedged
28	07/06/20	1.063	20/08/20	1.0334	74	-297	10,334	350	2	594	-106	10,228	Unhedged
29	07/06/20	1.063	17/09/20	1.0269	102	-362	10,269	395	2	724	-66	10,203	Unhedged
30	07/06/20	1.063	17/12/20	1.0051	193	-580	10,051	530	2	1160	100	10,151	Hedged
31	07/07/20	1.057	16/07/20	1.0361	9	-213	10,361	190	2	426	46	10,407	Hedged
32	07/07/20	1.057	20/08/20	1.0334	44	-240	10,334	290	2	480	-100	10,234	Unhedged
33	07/07/20	1.057	17/09/20	1.0269	72	-305	10,269	340	2	610	-70	10,199	Unhedged
34	07/07/20	1.057	17/12/20	1.0051	163	-523	10,051	465	2	1046	116	10,167	Hedged
35	07/07/20	1.057	18/03/20	0.9895	254	-679	9,895	550	2	1358	258	10,153	Hedged
36	06/08/20	1.015	20/08/20	10334	14	183	10,334	80	2	Unexercise	-160	10,174	Unhedged
37	06/08/20	1.015	17/09/20	1.0269	42	118	10,269	120	2	Unexercise	-240	10,029	Unhedged
38	06/08/20	1.015	15/10/20	1.0023	70	-128	10,023	280	2	256	-304	9,719	Unhedged
39	06/08/20	1.015	17/12/20	1.0051	133	-100	10,051	355	2	200	-510	9,541	Unhedged
40	06/08/20	1.015	18/03/20	0.9895	224	-256	9,895	435	2	512	-358	9,537	Unhedged
41	07/09/20	1.036	17/09/20	1.0269	10	-93	10,269	54	2	186	78	10,347	Hedged
42	07/09/20	1.036	15/10/20	1.0023	38	-339	10,023	125	2	678	428	10,451	Hedged
43	07/09/20	1.036	19/11/20	1.0201	73	-161	10,201	186	2	322	-50	10,151	Unhedged
44	07/09/20	1.036	17/12/20	1.0051	101	-311	10,051	225	2	622	172	10,223	Hedged
45	07/09/20	1.036	18/03/20	0.9895	192	-467	9,895	329	2	934	276	10,171	Hedged
46	06/10/20	1.020	15/10/20	1.0023	9	-179	10,023	136	2	358	86	10,109	Hedged
47	06/10/20	1.020	19/11/20	1.0201	44	-1	10,201	225	2	2	-448	9,753	Unhedged
48	06/10/20	1.020	17/12/20	1.0051	72	-151	10,051	271	2	302	-240	9,811	Unhedged
49	06/10/20	1.020	18/03/20	0.9895	163	-307	9,895	377	2	614	-140	9,755	Unhedged
50	06/10/20	1.020	17/06/20	0.9823	254	-379	9,823	505	2	758	-252	9,571	Unhedged
51	05/11/20	1.005	19/11/20	1.0201	14	147	10,201	113	2	Unexercise	-226	9,975	Unhedged
52	05/11/20	1.005	17/12/20	1.0051	42	-3	10,051	173	2	6	-340	9,711	Unhedged
53	05/11/20	1.005	21/01/20	0.9979	77	-75	9,979	228	2	150	-306	9,673	Unhedged
54	05/11/20	1.005	18/03/20	0.9895	133	-159	9,895	299	2	318	-280	9,615	Unhedged
55	05/11/20	1.005	17/06/20	0.9823	224	-231	9,823	435	2	462	-408	9,415	Unhedged
56	06/12/20	1.004	17/12/20	1.0051	11	6	10,051	77	2	Unexercise	-154	9,897	Unhedged
57	06/12/20	1.004	21/01/20	0.9979	46	-66	9,979	141	2	132	-150	9,829	Unhedged
58	06/12/20	1.004	18/02/20	0.9845	74	-200	9,845	187	2	400	26	9,871	Hedged
59	06/12/20	1.004	18/03/20	0.9895	102	-150	9,895	224	2	300	-148	9,747	Unhedged
60	06/12/20	1.004	17/06/20	0.9823	193	-222	9,823	355	2	444	-266	9,557	Unhedged

Table 4.4: Summary of Table 4.3 (Exporters - First Strategy)

MONTH	HEDGING DURATION (DAYS)	**% OF CASES WHERE HEDGED POSITION PERFORMED BETTER**
January 2010	9, 44, 72, 163, 254	**0%**
February 2010	14, 42, 70, 133, 224	**80%**
March 2010	14, 42, 77, 105, 196	**40%**
April 2010	11, 46, 74, 165, 256	**0%**
May 2010	16, 44, 72, 135, 226	**0%**
June 2010	11, 39, 74, 102, 193	**40%**
July 2010	9, 44, 72, 163, 254	**60%**
August 2010	14, 42, 70, 133, 224	**0%**
September 2010	10, 38, 73, 101, 192	**80%**
October 2010	9, 44, 72, 163, 254	**20%**
November 2010	14, 42, 77, 133, 224	**0%**
December 2010	11, 46, 74, 102, 193	**20%**
OVERALL % WHERE HEDGED POSITION PERFORMED BETTER IN 2010		**28.33%**

4.4.1.2 Second Strategy: Short Call Options on USX with at the Money Exercise Price

In table 4.3, by shorting two call options on USX between 06 Jan 2010 to 15 Jan 2010, a Canadian exporter with 10,000.00USD receivable can increase his potential export revenue from 10,294.00CAD to 10,384.00CAD. Such potential export revenue can be increased by using the said hedging strategy during 05 Feb 2010 to 19 Feb 2010 for

234.00CAD. The table depicts that selling USX call options as hedging tactic for Canadian exporters had a high level of better performance during 2010 although this strategy is not supposed to cover the foreign exchange risk entirely. The strategy had better performance in almost 90% because among 60 cases (5 cases in each month), only 6 cases had negative result. One of these six cases was in March, two in April, one in May, one in August, and one November which correspondingly caused a loss of 178CAD, 766CAD, 32CAD, 514CAD, 52CAD, and 170CAD respectively. Other fifty four cases performed better than the unhedged positions.

The best case is the fifth item whereby the exporter has hedged his foreign exchange risk exposure on 6th Jan 2010 for duration of 254 days and consequently, has augmented his export revenue from 10,269.00CAD to 11,199.00CAD (equal to 930CAD). In view of the fact that the option contracts with long expiration have high premium, longer hedging periods in the most cases of this strategy have well increased the potential export revenue (see the fifth item with 254 days duration). Conversly, the 16thand 46th items that were short term hedging, had lower level of performance. Even the 26th, 31st, and 56th items with duration of 9 to 16 days, provided adverse results. As the USD mostly depreciated during 2010, only 13 out of 60 items of the soldcall options have been exercised by option holders. This might be an additional reason for the better performance of the strategy during the analysis period. This hedging strategy looks like the covered call or buy-write strategy in stock market whereby a stockholder shorts call option on the underlying stock with the purpose of earning extra revenue in short run.

Table 4.5: Second Hedging Strategy for Canadian Exporters

Item	First Date	USD / CAD on First Date	Last Date	USD / CAD on Last Date	Duration (Days)	Foreign Exchange Gain/Loss on Export Contract (Unhedged Position)	**Final value (unhedged position as per rate on last date)**	Premium for each Call Contract on USX	Number of required Call contracts	Gain/Loss from Short Call Options	Net Gain / Loss from Short Call Options	**Final Value (Hedged Position)**	**Comparison**
1	06/01/20	1.039	15/01/20	1.0294	9	-96	10,294	45	2	Unexercise	90	10,384	Hedged
2	06/01/20	1.039	19/02/20	1.0452	44	62	10,452	141	2	-124	158	10,610	Hedged
3	06/01/20	1.039	19/03/20	1.0123	72	-267	10,123	204	2	Unexercise	408	10,531	Hedged
4	06/01/20	1.039	18/06/20	1.0273	163	-117	10,273	351	2	Unexercise	702	10,975	Hedged
5	06/01/20	1.039	17/09/20	1.0269	254	-121	10,269	465	2	Unexercise	930	11,199	Hedged
6	05/02/20	1.064	19/02/20	1.0452	14	-195	10,452	117	2	Unexercise	234	10,686	Hedged
7	05/02/20	1.064	19/03/20	1.0123	42	-524	10,123	200	2	Unexercise	400	10,523	Hedged
8	05/02/20	1.064	16/04/20	0.9997	70	-650	9,997	256	2	Unexercise	512	10,509	Hedged
9	05/02/20	1.064	18/06/20	1.0273	133	-374	10,273	357	2	Unexercise	714	10,987	Hedged
10	05/02/20	1.064	17/09/20	1.0269	224	-378	10,269	467	2	Unexercise	934	11,203	Hedged
11	05/03/20	1.031	19/03/20	1.0123	14	-191	10,123	70	2	Unexercise	140	10,263	Hedged
12	05/03/20	1.031	16/04/20	0.9997	42	-317	9,997	130	2	Unexercise	260	10,257	Hedged
13	05/03/20	1.031	21/05/20	1.0598	77	284	10,598	195	2	-568	-178	10,420	Unhedged
14	05/03/20	1.031	18/06/20	1.0273	105	-41	10,273	230	2	Unexercise	460	10,733	Hedged
15	05/03/20	1.031	17/09/20	1.0269	196	-45	10,269	340	2	Unexercise	680	10,949	Hedged
16	05/04/20	1.011	16/04/20	0.9997	11	-119	9,997	34	2	Unexercise	68	10,065	Hedged
17	05/04/20	1.011	21/05/20	1.0598	46	482	10,598	99	2	-964	-766	9,832	Unhedged
18	05/04/20	1.011	18/06/20	1.0273	74	157	10,273	141	2	-314	-32	10,241	Unhedged
19	05/04/20	1.011	17/09/20	1.0269	165	153	10,269	249	2	-306	192	10,461	Hedged
20	05/04/20	1.011	17/12/20	1.0051	256	-65	10,051	332	2	Unexercise	664	10,715	Hedged
21	05/05/20	1.019	21/05/20	1.0598	16	407	10,598	150	2	-814	-514	10,084	Unhedged
22	05/05/20	1.019	18/06/20	1.0273	44	82	10,273	215	2	-164	266	10,539	Hedged
23	05/05/20	1.019	16/07/20	1.0361	72	170	10,361	265	2	-340	190	10,551	Hedged

24	05/05/20	1.019	17/09/20	1.0269	135	78	10,269	355	2	-156	554	10,823	Hedged
25	05/05/20	1.019	17/12/20	1.0051	226	-140	10,051	460	2	Unexercise	920	10,971	Hedged
26	07/06/20	1.063	18/06/20	1.0273	11	-358	10,273	101	2	Unexercise	202	10,475	Hedged
27	07/06/20	1.063	16/07/20	1.0361	39	-270	10,361	181	2	Unexercise	362	10,723	Hedged
28	07/06/20	1.063	20/08/20	1.0334	74	-297	10,334	259	2	Unexercise	518	10,852	Hedged
29	07/06/20	1.063	17/09/20	1.0269	102	-362	10,269	307	2	Unexercise	614	10,883	Hedged
30	07/06/20	1.063	17/12/20	1.0051	193	-580	10,051	425	2	Unexercise	850	10,901	Hedged
31	07/07/20	1.057	16/07/20	1.0361	9	-213	10,361	57	2	Unexercise	114	10,475	Hedged
32	07/07/20	1.057	20/08/20	1.0334	44	-240	10,334	156	2	Unexercise	312	10,646	Hedged
33	07/07/20	1.057	17/09/20	1.0269	72	-305	10,269	211	2	Unexercise	422	10,691	Hedged
34	07/07/20	1.057	17/12/20	1.0051	163	-523	10,051	341	2	Unexercise	682	10,733	Hedged
35	07/07/20	1.057	18/03/20	0.9895	254	-679	9,895	445	2	Unexercise	890	10,785	Hedged
36	06/08/20	1.015	20/08/20	1.0334	14	183	10,334	157	2	-366	-52	10,282	Unhedged
37	06/08/20	1.015	17/09/20	1.0269	42	118	10,269	215	2	-236	194	10,463	Hedged
38	06/08/20	1.015	15/10/20	1.0023	70	-128	10,023	266	2	Unexercise	532	10,555	Hedged
39	06/08/20	1.015	17/12/20	1.0051	133	-100	10,051	356	2	Unexercise	712	10,763	Hedged
40	06/08/20	1.015	18/03/20	0.9895	224	-256	9,895	300	2	Unexercise	600	10,495	Hedged
41	07/09/20	1.036	17/09/20	1.0269	10	-93	10,269	125	2	Unexercise	250	10,519	Hedged
42	07/09/20	1.036	15/10/20	1.0023	38	-339	10,023	201	2	Unexercise	402	10,425	Hedged
43	07/09/20	1.036	19/11/20	1.0201	73	-161	10,201	270	2	Unexercise	540	10,741	Hedged
44	07/09/20	1.036	17/12/20	1.0051	101	-311	10,051	314	2	Unexercise	628	10,679	Hedged
45	07/09/20	1.036	18/03/20	0.9895	192	-467	9,895	428	2	Unexercise	856	10,751	Hedged
46	06/10/20	1.020	15/10/20	1.0023	9	-179	10,023	41	2	Unexercise	82	10,105	Hedged
47	06/10/20	1.020	19/11/20	1.0201	44	-1	10,201	138	2	Unexercise	276	10,477	Hedged
48	06/10/20	1.020	17/12/20	1.0051	72	-151	10,051	180	2	Unexercise	360	10,411	Hedged
49	06/10/20	1.020	18/03/20	0.9895	163	-307	9,895	310	2	Unexercise	620	10,515	Hedged
50	06/10/20	1.020	17/06/20	0.9823	254	-379	9,823	370	2	Unexercise	740	10,563	Hedged
51	05/11/20	1.005	19/11/20	1.0201	14	147	10,201	62	2	-294	-170	10,031	Unhedged
52	05/11/20	1.005	17/12/20	1.0051	42	-3	10,051	130	2	Unexercise	260	10,311	Hedged
53	05/11/20	1.005	21/01/20	0.9979	77	-75	9,979	185	2	Unexercise	370	10,349	Hedged
54	05/11/20	1.005	18/03/20	0.9895	133	-159	9,895	270	2	Unexercise	540	10,435	Hedged
55	05/11/20	1.005	17/06/20	0.9823	224	-231	9,823	340	2	Unexercise	680	10,503	Hedged
56	06/12/20	1.004	17/12/20	1.0051	11	6	10,051	75	2	-12	138	10,189	Hedged
57	06/12/20	1.004	21/01/20	0.9979	46	-66	9,979	145	2	Unexercise	290	10,269	Hedged
58	06/12/20	1.004	18/02/20	0.9845	74	-200	9,845	195	2	Unexercise	390	10,235	Hedged
59	06/12/20	1.004	18/03/20	0.9895	102	-150	9,895	240	2	Unexercise	480	10,375	Hedged
60	06/12/20	1.004	17/06/20	0.9823	193	-222	9,823	325	2	Unexercise	650	10,473	Hedged

Table 4.6: Summary of Table 4.5 (Exporters - Second Strategy)

MONTH	HEDGING DURATION (DAYS)	**% OF CASES WHERE HEDGED POSITION PERFORMED BETTER**
January 2010	9, 44, 72, 163, 254	**100%**
February 2010	14, 42, 70, 133, 224	**100%**
March 2010	14, 42, 77, 105, 196	**80%**
April 2010	11, 46, 74, 165, 256	**60%**
May 2010	16, 44, 72, 135, 226	**80%**
June 2010	11, 39, 74, 102, 193	**100%**
July 2010	9, 44, 72, 163, 254	**100%**
August 2010	14, 42, 70, 133, 224	**80%**
September 2010	10, 38, 73, 101, 192	**100%**
October 2010	9, 44, 72, 163, 254	**100%**
November 2010	14, 42, 77, 133, 224	**80%**
December 2010	11, 46, 74, 102, 193	**100%**
OVERALL % WHERE HEDGED POSITION PERFORMED BETTER IN 2010		**90%**

4.4.1.3 Third Strategy: Long Put and Short Call Options on USX with at the Money Exercise Price

What distinguishes this strategy from the other two hedging strategies is its unique position that contains both long put and short call options on USX. In fact, it is somehow a combination of the other two hedging strategies. According to website of

Montreal Exchange, this hedging strategy is called synthetic strategy and the relevant position under the strategy is consequently called synthetic position (http://www.m-x.ca/accueil_en.php).

During Feb 2010, all the written (short) call options remained unexercised whereas all the long put options have been duly exercised since USD depreciated in value. On the other hand, during April and May, most of the long put options remained unexercised while holders of the call options have mostly exercised the contracts. In 45 out of 60 items, the end values of the hedged position are greater than that of the unhedged position, a 75% better performance for the hedged positions. In worst scenario under the synthetic position, potential losses from the sold call option can be compensated by the gain on export contract. The value of US dollar dramatically appreciated during April and May. Hence, the exporters had no choice but letting holders of the call options benefit from such movement of the FX rate. This caused the hedging strategy perform more than the unhedged position during this period. In others months, the strategy performed better. This strategy reduces the hedging costs for the exporter. While the exporter covers the risk of the adverse movement of the exchange rate by longing the put option, he decreases the insurance costs by shorting call options. As an example, during Jan 2010, the average hedging cost via this strategy was 78.40CAD whereas the first and second strategies in the same period had the costs of 639.20CAD and 482.40CADrespectively.

Table 4.7: Third Hedging Strategy for Canadian Exporters (Synthetic Strategy)

Item	First Date	USD / CAD on First Date	Last Date	USD/CAD on Last Date	Duration (Days)	Foreign Exchange Gain/Loss on Import Contract (Unhedged Position)	**Final Value (Unhedged Position As Per Rate on Last Date)**	Premium for each Put Contract	Number of required Put contracts	Gain / Loss from Long Put Options	Premium for each Call Contract	Number of required Call contracts	Gain / Loss from Short Call Options	**Final Value (Hedged Position)**	**Comparison**
1	06/01/2	1.0390	15/01/201	1.0294	9	-96	10,294	127	1	96	45	1	Unexercise	10,308	Hedged
2	06/01/2	1.0390	19/02/201	1.0452	44	62	10,452	222	1	Unexercised	141	1	-62	10,309	Unhedged
3	06/01/2	1.0390	19/03/201	1.0123	72	-267	10,123	285	1	267	204	1	Unexercise	10,309	Hedged
4	06/01/2	1.0390	18/06/201	1.0273	163	-117	10,273	429	1	117	351	1	Unexercise	10,312	Hedged
5	06/01/2	1.0390	17/09/201	1.0269	254	-121	10,269	535	1	121	465	1	Unexercise	10,320	Hedged
6	05/02/2	1.0647	19/02/201	1.0452	14	-195	10,452	75	1	195	117	1	Unexercise	10,689	Hedged
7	05/02/2	1.0647	19/03/201	1.0123	42	-524	10,123	155	1	524	200	1	Unexercise	10,692	Hedged
8	05/02/2	1.0647	16/04/201	0.9997	70	-650	9,997	215	1	650	256	1	Unexercise	10,688	Hedged
9	05/02/2	1.0647	18/06/201	1.0273	133	-374	10,273	325	1	374	357	1	Unexercise	10,679	Hedged
10	05/02/2	1.0647	17/09/201	1.0269	224	-378	10,269	430	1	378	467	1	Unexercise	10,684	Hedged
11	05/03/2	1.0314	19/03/201	1.0123	14	-191	10,123	95	1	191	70	1	Unexercise	10,289	Hedged
12	05/03/2	1.0314	16/04/201	0.9997	42	-317	9,997	155	1	317	130	1	Unexercise	10,289	Hedged
13	05/03/2	1.0314	21/05/201	1.0598	77	284	10,598	215	1	Unexercised	195	1	-284	10,294	Unhedged
14	05/03/2	1.0314	18/06/201	1.0273	105	-41	10,273	265	1	41	230	1	Unexercise	10,279	Hedged
15	05/03/2	1.0314	17/09/201	1.0269	196	-45	10,269	370	1	45	340	1	Unexercise	10,284	Hedged
16	05/04/2	1.0116	16/04/201	0.9997	11	-119	9,997	135	1	119	34	1	Unexercise	10,015	Hedged
17	05/04/2	1.0116	21/05/201	1.0598	46	482	10,598	200	1	Unexercised	99	1	-482	10,015	Unhedged
18	05/04/2	1.0116	18/06/201	1.0273	74	157	10,273	240	1	Unexercised	141	1	-157	10,017	Unhedged
19	05/04/2	1.0116	17/09/201	1.0269	165	153	10,269	345	1	Unexercised	249	1	-153	10,020	Unhedged
20	05/04/2	1.0116	17/12/201	1.0051	256	-65	10,051	410	1	65	332	1	Unexercise	10,038	Unhedged
21	05/05/2	1.0191	21/05/201	1.0598	16	407	10,598	90	1	Unexercised	150	1	-407	10,251	Unhedged
22	05/05/2	1.0191	18/06/201	1.0273	44	82	10,273	150	1	Unexercised	215	1	-82	10,256	Unhedged
23	05/05/2	1.0191	16/07/201	1.0361	72	170	10,361	195	1	Unexercised	265	1	-170	10,261	Unhedged
24	05/05/2	1.0191	17/09/201	1.0269	135	78	10,269	280	1	Unexercised	355	1	-78	10,266	Unhedged

25	05/05/2	1.0191	17/12/201	1.0051	226	-140	10,051	365	1	140	460	1	Unexercise	10,286	Hedged
26	07/06/2	1.0631	18/06/201	1.0273	11	-358	10,273	205	1	358	101	1	Unexercise	10,527	Hedged
27	07/06/2	1.0631	16/07/201	1.0361	39	-270	10,361	280	1	270	181	1	Unexercise	10,532	Hedged
28	07/06/2	1.0631	20/08/201	1.0334	74	-297	10,334	350	1	297	259	1	Unexercise	10,540	Hedged
29	07/06/2	1.0631	17/09/201	1.0269	102	-362	10,269	395	1	362	307	1	Unexercise	10,543	Hedged
30	07/06/2	1.0631	17/12/201	1.0051	193	-580	10,051	530	1	580	425	1	Unexercise	10,526	Hedged
31	07/07/2	1.0574	16/07/201	1.0361	9	-213	10,361	190	1	213	57	1	Unexercise	10,441	Hedged
32	07/07/2	1.0574	20/08/201	1.0334	44	-240	10,334	290	1	240	156	1	Unexercise	10,440	Hedged
33	07/07/2	1.0574	17/09/201	1.0269	72	-305	10,269	340	1	305	211	1	Unexercise	10,445	Hedged
34	07/07/2	1.0574	17/12/201	1.0051	163	-523	10,051	465	1	523	341	1	Unexercise	10,450	Hedged
35	07/07/2	1.0574	18/03/201	0.9895	254	-679	9,895	550	1	679	445	1	Unexercise	10,469	Hedged
36	06/08/2	1.0151	20/08/201	1.0334	14	183	10,334	80	1	Unexercised	157	1	-183	10,228	Unhedged
37	06/08/2	1.0151	17/09/201	1.0269	42	118	10,269	120	1	Unexercised	215	1	-118	10,246	Unhedged
38	06/08/2	1.0151	15/10/201	1.0023	70	-128	10,023	280	1	128	266	1	Unexercise	10,137	Hedged
39	06/08/2	1.0151	17/12/201	1.0051	133	-100	10,051	355	1	100	356	1	Unexercise	10,152	Hedged
40	06/08/2	1.0151	18/03/201	0.9895	224	-256	9,895	435	1	256	300	1	Unexercise	10,016	Hedged
41	07/09/2	1.0362	17/09/201	1.0269	10	-93	10,269	54	1	93	125	1	Unexercise	10,433	Hedged
42	07/09/2	1.0362	15/10/201	1.0023	38	-339	10,023	125	1	339	201	1	Unexercise	10,438	Hedged
43	07/09/2	1.0362	19/11/201	1.0201	73	-161	10,201	186	1	161	270	1	Unexercise	10,446	Hedged
44	07/09/2	1.0362	17/12/201	1.0051	101	-311	10,051	225	1	311	314	1	Unexercise	10,451	Hedged
45	07/09/2	1.0362	18/03/201	0.9895	192	-467	9,895	329	1	467	428	1	Unexercise	10,461	Hedged
46	06/10/2	1.0202	15/10/201	1.0023	9	-179	10,023	136	1	179	41	1	Unexercise	10,107	Hedged
47	06/10/2	1.0202	19/11/201	1.0201	44	-1	10,201	225	1	1	138	1	Unexercise	10,115	Unhedged
48	06/10/2	1.0202	17/12/201	1.0051	72	-151	10,051	271	1	151	180	1	Unexercise	10,111	Hedged
49	06/10/2	1.0202	18/03/201	0.9895	163	-307	9,895	377	1	307	310	1	Unexercise	10,135	Hedged
50	06/10/2	1.0202	17/06/201	0.9823	254	-379	9,823	505	1	379	370	1	Unexercise	10,067	Hedged
51	05/11/2	1.0054	19/11/201	1.0201	14	147	10,201	113	1	Unexercised	62	1	-147	10,003	Unhedged
52	05/11/2	1.0054	17/12/201	1.0051	42	-3	10,051	173	1	3	130	1	Unexercise	10,011	Unhedged
53	05/11/2	1.0054	21/01/201	0.9979	77	-75	9,979	228	1	75	185	1	Unexercise	10,011	Hedged
54	05/11/2	1.0054	18/03/201	0.9895	133	-159	9,895	299	1	159	270	1	Unexercise	10,025	Hedged
55	05/11/2	1.0054	17/06/201	0.9823	224	-231	9,823	435	1	231	340	1	Unexercise	9,959	Hedged
56	06/12/2	1.0045	17/12/201	1.0051	11	6	10,051	77	1	Unexercised	75	1	-6	10,114	Hedged
57	06/12/2	1.0045	21/01/201	0.9979	46	-66	9,979	141	1	66	145	1	Unexercise	10,049	Hedged
58	06/12/2	1.0045	18/02/201	0.9845	74	-200	9,845	187	1	200	195	1	Unexercise	10,053	Hedged
59	06/12/2	1.0045	18/03/201	0.9895	102	-150	9,895	224	1	150	240	1	Unexercise	10,061	Hedged
60	06/12/2	1.0045	17/06/201	0.9823	193	-222	9,823	355	1	222	325	1	Unexercise	10,015	Hedged

Table 4.8: Summary of Table 4.7 (Exporters - Third Strategy)

MONTH	HEDGING DURATION (DAYS)	**% OF CASES WHERE HEDGED POSITION PERFORMED BETTER**
January 2010	9, 44, 72, 163, 254	**80%**
February 2010	14, 42, 70, 133, 224	**100%**
March 2010	14, 42, 77, 105, 196	**80%**
April 2010	11, 46, 74, 165, 256	**20%**
May 2010	16, 44, 72, 135, 226	**20%**
June 2010	11, 39, 74, 102, 193	**100%**
July 2010	9, 44, 72, 163, 254	**100%**
August 2010	14, 42, 70, 133, 224	**60%**
September 2010	10, 38, 73, 101, 192	**100%**
October 2010	9, 44, 72, 163, 254	**80%**
November 2010	14, 42, 77, 133, 224	**60%**
December 2010	11, 46, 74, 102, 193	**100%**
OVERALL % WHERE HEDGED POSITIO PERFORMED BETTER IN 2010		**75%**

4.4.2 Comparing Hedged and Unhedged Positions: Canadian Importers

Hereunder, the results related each hedging strategy for Canadian importers are discussed.

4.4.2.1 First strategy: Long Call Option on USX with at the Money Exercise Price

Following the information reflected in tables 4.7 and 4.8; Canadian importers could rarely get positive result from purchasing call options on USX as foreign exchange hedging during 2010. For hedging on January, February, June, July, August, September, October, and December, the strategy worked entirely inefficient. Only short term hedging (9 to 16 days) on May and November, 46 days hedging on April and 77 days hedging on March gave desirable results. Totally, in 93.3% of the cases, the end value of unhedged position was greater than the hedged position for the importers. One reason is that U.S. dollar has generally depreciated in value during 2010 so that most of the long call options on USX remained unexercised. Nonetheless in nine cases (items 2, 18, 19, 22, 23, 24, 36, 37 & 56 in table 4.7), the value of USD appreciated against CAD and accordingly, the long call options were exercised, but the value of hedged position is still less than that of the unhedged position after accounting for the cost of option premiums.

The long term hedging on Feb, May, and July represents the worst cases whereby not only the strategy could not stabilize the import value in CAD but also lead to loss of 1000.00 CAD, 1,040.00 CAD, and 1,070.00 CAD respectively. On the other hand, the 46 days hedging on April and the short term hedging in May, represent the best cases whereby the value of the hedged position increased by CAD 714.00 and CAD 424.00 correspondingly.

Table 4.9: First Hedging Strategy for Canadian Importers

Item	First Date	USD / CAD on First Date	Last Date	USD / CAD on Last Date	Duration (Days)	Foreign Exchange Gain/Loss on Import Contract (Unhedged Position)	**Final value (unhedged position as per rate on last date)**	Premium for each Call Contract on USX	Number of required call contracts	Gain/Loss from Long Call Options	Net Gain / Loss from Long Call Options	**Final Value (Hedged Position)**	**Comparison**
1	06/01/201	1.0390	15/01/20	1.029	9	96	10,294	50	2	Unexercise	-100	10,194	Unhedged
2	06/01/201	1.0390	19/02/20	1.045	44	-62	10,452	146	2	124	-168	10,284	Unhedged
3	06/01/201	1.0390	19/03/20	1.012	72	267	10,123	209	2	Unexercise	-418	9,705	Unhedged
4	06/01/201	1.0390	18/06/20	1.027	163	117	10,273	356	2	Unexercise	-712	9,561	Unhedged
5	06/01/201	1.0390	17/09/20	1.027	254	121	10,269	470	2	Unexercise	-940	9,329	Unhedged
6	05/02/201	1.0647	19/02/20	1.045	14	195	10,452	125	2	Unexercise	-250	10,202	Unhedged
7	05/02/201	1.0647	19/03/20	1.012	42	524	10,123	210	2	Unexercise	-420	9,703	Unhedged
8	05/02/201	1.0647	16/04/20	1	70	650	9,997	270	2	Unexercise	-540	9,457	Unhedged
9	05/02/201	1.0647	18/06/20	1.027	133	374	10,273	380	2	Unexercise	-760	9,513	Unhedged
10	05/02/201	1.0647	17/09/20	1.027	224	378	10,269	500	2	Unexercise	-1000	9,269	Unhedged
11	05/03/201	1.0314	19/03/20	1.012	14	191	10,123	100	2	Unexercise	-200	9,923	Unhedged
12	05/03/201	1.0314	16/04/20	1	42	317	9,997	160	2	Unexercise	-320	9,677	Unhedged
13	05/03/201	1.0314	21/05/20	1.06	77	-284	10,598	225	2	568	118	10,716	Hedged
14	05/03/201	1.0314	18/06/20	1.027	105	41	10,273	275	2	Unexercise	-550	9,723	Unhedged
15	05/03/201	1.0314	17/09/20	1.027	196	45	10,269	385	2	Unexercise	-770	9,499	Unhedged
16	05/04/201	1.0116	16/04/20	1	11	119	9,997	60	2	Unexercise	-120	9,877	Unhedged
17	05/04/201	1.0116	21/05/20	1.06	46	-482	10,598	125	2	964	714	11,312	Hedged
18	05/04/201	1.0116	18/06/20	1.027	74	-157	10,273	170	2	314	-26	10,247	Unhedged
19	05/04/201	1.0116	17/09/20	1.027	165	-153	10,269	285	2	306	-264	10,005	Unhedged
20	05/04/201	1.0116	17/12/20	1.005	256	65	10,051	370	2	Unexercise	-740	9,311	Unhedged
21	05/05/201	1.0191	21/05/20	1.06	16	-407	10,598	195	2	814	424	11,022	Hedged
22	05/05/201	1.0191	18/06/20	1.027	44	-82	10,273	275	2	164	-386	9,887	Unhedged
23	05/05/201	1.0191	16/07/20	1.036	72	-170	10,361	320	2	340	-300	10,061	Unhedged
24	05/05/201	1.0191	17/09/20	1.027	135	-78	10,269	410	2	156	-664	9,605	Unhedged

25	05/05/201	1.0191	17/12/20	1.005	226	140	10,051	520	2	Unexercise	-1040	9,011	Unhedged
26	07/06/201	1.0631	18/06/20	1.027	11	358	10,273	110	2	Unexercise	-220	10,053	Unhedged
27	07/06/201	1.0631	16/07/20	1.036	39	270	10,361	210	2	Unexercise	-420	9,941	Unhedged
28	07/06/201	1.0631	20/08/20	1.033	74	297	10,334	265	2	Unexercise	-530	9,804	Unhedged
29	07/06/201	1.0631	17/09/20	1.027	102	362	10,269	335	2	Unexercise	-670	9,599	Unhedged
30	07/06/201	1.0631	17/12/20	1.005	193	580	10,051	460	2	Unexercise	-920	9,131	Unhedged
31	07/07/201	1.0574	16/07/20	1.036	9	213	10,361	140	2	Unexercise	-280	10,081	Unhedged
32	07/07/201	1.0574	20/08/20	1.033	44	240	10,334	245	2	Unexercise	-490	9,844	Unhedged
33	07/07/201	1.0574	17/09/20	1.027	72	305	10,269	300	2	Unexercise	-600	9,669	Unhedged
34	07/07/201	1.0574	17/12/20	1.005	163	523	10,051	430	2	Unexercise	-860	9,191	Unhedged
35	07/07/201	1.0574	18/03/20	0.99	254	679	9,895	535	2	Unexercise	-1070	8,825	Unhedged
36	06/08/201	1.0151	20/08/20	1.033	14	-183	10,334	225	2	366	-84	10,250	Unhedged
37	06/08/201	1.0151	17/09/20	1.027	42	-118	10,269	325	2	236	-414	9,855	Unhedged
38	06/08/201	1.0151	15/10/20	1.002	70	128	10,023	375	2	Unexercise	-750	9,273	Unhedged
39	06/08/201	1.0151	17/12/20	1.005	133	100	10,051	465	2	Unexercise	-465	9,586	Unhedged
40	06/08/201	1.0151	18/03/20	0.99	224	256	9,895	560	2	Unexercise	-560	9,335	Unhedged
41	07/09/201	1.0362	17/09/20	1.027	10	93	10,269	131	2	Unexercise	-131	10,138	Unhedged
42	07/09/201	1.0362	15/10/20	1.002	38	339	10,023	206	2	Unexercise	-206	9,817	Unhedged
43	07/09/201	1.0362	19/11/20	1.02	73	161	10,201	275	2	Unexercise	-275	9,926	Unhedged
44	07/09/201	1.0362	17/12/20	1.005	101	311	10,051	320	2	Unexercise	-320	9,731	Unhedged
45	07/09/201	1.0362	18/03/20	0.99	192	467	9,895	442	2	Unexercise	-442	9,453	Unhedged
46	06/10/201	1.0202	15/10/20	1.002	9	179	10,023	47	2	Unexercise	-47	9,976	Unhedged
47	06/10/201	1.0202	19/11/20	1.02	44	1	10,201	144	2	Unexercise	-144	10,057	Unhedged
48	06/10/201	1.0202	17/12/20	1.005	72	151	10,051	198	2	Unexercise	-198	9,853	Unhedged
49	06/10/201	1.0202	18/03/20	0.99	163	307	9,895	327	2	Unexercise	-327	9,568	Unhedged
50	06/10/201	1.0202	17/06/20	0.982	254	379	9,823	470	2	Unexercise	-470	9,353	Unhedged
51	05/11/201	1.0054	19/11/20	1.02	14	-147	10,201	70	2	294	154	10,355	Hedged
52	05/11/201	1.0054	17/12/20	1.005	42	3	10,051	137	2	Unexercise	-274	9,777	Unhedged
53	05/11/201	1.0054	21/01/20	0.998	77	75	9,979	200	2	Unexercise	-400	9,579	Unhedged
54	05/11/201	1.0054	18/03/20	0.99	133	159	9,895	286	2	Unexercise	-572	9,323	Unhedged
55	05/11/201	1.0054	17/06/20	0.982	224	231	9,823	435	2	Unexercise	-870	8,953	Unhedged
56	06/12/201	1.0045	17/12/20	1.005	11	-6	10,051	81	2	12	-150	9,901	Unhedged
57	06/12/201	1.0045	21/01/20	0.998	46	66	9,979	152	2	Unexercise	-304	9,675	Unhedged
58	06/12/201	1.0045	18/02/20	0.985	74	200	9,845	205	2	Unexercise	-410	9,435	Unhedged
59	06/12/201	1.0045	18/03/20	0.99	102	150	9,895	248	2	Unexercise	-496	9,399	Unhedged
60	06/12/201	1.0045	17/06/20	0.982	193	222	9,823	410	2	Unexercise	-820	9,003	Unhedged

Table 4.10: Summary of Table 4.9 (Importers- First Strategy)

MONTH	HEDGING DURATION (DAYS)	**% OF CASES WHERE HEDGED POSITION PERFORMED BETTER**
January 2010	9, 44, 72, 163, 254	**0%**
February 2010	14, 42, 70, 133, 224	**0%**
March 2010	14, 42, 77, 105, 196	**20%**
April 2010	11, 46, 74, 165, 256	**20%**
May 2010	16, 44, 72, 135, 226	**20%**
June 2010	11, 39, 74, 102, 193	**0%**
July 2010	9, 44, 72, 163, 254	**0%**
August 2010	14, 42, 70, 133, 224	**0%**
September 2010	10, 38, 73, 101, 192	**0%**
October 2010	9, 44, 72, 163, 254	**0%**
November 2010	14, 42, 77, 133, 224	**20%**
December 2010	11, 46, 74, 102, 193	**0%**
OVERALL % WHERE HEDGED POSITION PERFORMED BETTER IN 2010		**6.67%**

4.4.2.2 Second Strategy: Short Put Option on USX with at the Money Exercise Price

In comparison to the first strategy, the second one provided better hedging results for the Canadian importers of goods and services in 2010. Overall, in 61.6% of hedging positions which implies that in 37 out of 60 cases, hedged position performed better than the unhedged position. In January, May, and November, all hedging with any duration

via this strategy performed better. However, July was in contrast the worst month for this strategy because all hedging (no matter by which duration) failed. In view of the fact that the written put options were exercised in some cases, the result of hedging for some those cases were still positive. In fact, the values of received premiums for shorting put option were greater than the loss from adverse effect of the exchange rate movement. A clear example respecting this issue is the first item whereby the importer went to the short term hedging position by selling two put contracts on 06 Jan 2010. As the USD/CAD exchange rate changed during the hedging period from 1.0390 to 1.029, the option holder exercised his contract that caused the importer to bear a loss of 196CAD but as the importer was already in receipt of the 240CAD (premium of 2 put contracts); his overall hedged portfolio is still greater than the unhedged position.

Whenever the sold put options have not been exercised by the holder, the hedging was obviously successful. No exercise on sold put options means USD has appreciated. By appreciation of USD, the importer should have provided more money in CAD currency in order to cover the same amount of money in USD. Accounting for the received premiums for selling the put options, the overall hedged portfolio of the importer was in good status and still greater than the unhedged position. For instance, the initial rate of 1.0191 has turned to 1.027 but the hedging was still fruitful (because of the received premium of 240 CAD) in item 22 of table 4.9

Table 4.11: Second Hedging Strategy for Canadian Importers

Item	First Date	USD / CAD on First Date	Last Date	USD / CAD on Last Date	Duration (Days)	Foreign Exchange Gain/Loss on Import Contract (Unhedged Position)	**Final value (unhedged position as per rate on last date)**	Premium for each Put Contract on USX	Number of required Put contracts	Gain / Loss from Short Put Options	Net Gain / Loss from Short Put Options	**Final Value (Hedged Position)**	**Comparison**
1	06/01/201	1.0390	15/01/201	1.029	9	96	10,294	120	2	-192	48	10,342	Hedged
2	06/01/201	1.0390	19/02/201	1.045	44	-62	10,452	217	2	Unexercised	434	10,886	Hedged
3	06/01/201	1.0390	19/03/201	1.012	72	267	10,123	279	2	-534	24	10,147	Hedged
4	06/01/201	1.0390	18/06/201	1.027	163	117	10,273	424	2	-234	614	10,887	Hedged
5	06/01/201	1.0390	17/09/201	1.027	254	121	10,269	530	2	-242	818	11,087	Hedged
6	05/02/201	1.0647	19/02/201	1.045	14	195	10,452	67	2	-390	-256	10,196	Unhed
7	05/02/201	1.0647	19/03/201	1.012	42	524	10,123	149	2	-1048	-750	9,373	Unhed
8	05/02/201	1.0647	16/04/201	1	70	650	9,997	205	2	-1300	-890	9,107	Unhed
9	05/02/201	1.0647	18/06/201	1.027	133	374	10,273	307	2	-748	-134	10,139	Unhed
10	05/02/201	1.0647	17/09/201	1.027	224	378	10,269	414	2	-756	72	10,341	Hedged
11	05/03/201	1.0314	19/03/201	1.012	14	191	10,123	65	2	-382	-252	9,871	Unhed
12	05/03/201	1.0314	16/04/201	1	42	317	9,997	125	2	-634	-384	9,613	Unhed
13	05/03/201	1.0314	21/05/201	1.06	77	-284	10,598	185	2	Unexercised	370	10,968	Hedged
14	05/03/201	1.0314	18/06/201	1.027	105	41	10,273	220	2	-82	358	10,631	Hedged
15	05/03/201	1.0314	17/09/201	1.027	196	45	10,269	325	2	-90	560	10,829	Hedged
16	05/04/201	1.0116	16/04/201	1	11	119	9,997	103	2	-238	-32	9,965	Unhed
17	05/04/201	1.0116	21/05/201	1.06	46	-482	10,598	169	2	Unexercised	338	10,936	Hedged
18	05/04/201	1.0116	18/06/201	1.027	74	-157	10,273	209	2	Unexercised	418	10,691	Hedged
19	05/04/201	1.0116	17/09/201	1.027	165	-153	10,269	310	2	Unexercised	620	10,889	Hedged
20	05/04/201	1.0116	17/12/201	1.005	256	65	10,051	375	2	-130	620	10,671	Hedged
21	05/05/201	1.0191	21/05/201	1.06	16	-407	10,598	60	2	Unexercised	120	10,718	Hedged
22	05/05/201	1.0191	18/06/201	1.027	44	-82	10,273	120	2	Unexercised	240	10,513	Hedged
23	05/05/201	1.0191	16/07/201	1.036	72	-170	10,361	170	2	Unexercised	340	10,701	Hedged
24	05/05/201	1.0191	17/09/201	1.027	135	-78	10,269	250	2	Unexercised	500	10,769	Hedged

25	05/05/201	1.0191	17/12/201	1.005	226	140	10,051	340	2	-280	400	10,451	Hedged
26	07/06/201	1.0631	18/06/201	1.027	11	358	10,273	147	2	-716	-422	9,851	Unhed
27	07/06/201	1.0631	16/07/201	1.036	39	270	10,361	225	2	-540	-90	10,271	Unhed
28	07/06/201	1.0631	20/08/201	1.033	74	297	10,334	300	2	-594	6	10,340	Hedged
29	07/06/201	1.0631	17/09/201	1.027	102	362	10,269	345	2	-724	-34	10,235	Unhed
30	07/06/201	1.0631	17/12/201	1.005	193	580	10,051	452	2	-1160	-256	9,795	Unhed
31	07/07/201	1.0574	16/07/201	1.036	9	213	10,361	126	2	-426	-174	10,187	Unhed
32	07/07/201	1.0574	20/08/201	1.033	44	240	10,334	221	2	-480	-38	10,296	Unhed
33	07/07/201	1.0574	17/09/201	1.027	72	305	10,269	273	2	-610	-64	10,205	Unhed
34	07/07/201	1.0574	17/12/201	1.005	163	523	10,051	395	2	-1046	-256	9,795	Unhed
35	07/07/201	1.0574	18/03/201	0.99	254	679	9,895	480	2	-1358	-398	9,497	Unhed
36	06/08/201	1.0151	20/08/201	1.033	14	-183	10,334	30	2	Unexercised	60	10,394	Hedged
37	06/08/201	1.0151	17/09/201	1.027	42	-118	10,269	81	2	Unexercised	162	10,431	Hedged
38	06/08/201	1.0151	15/10/201	1.002	70	128	10,023	127	2	-256	-2	10,021	Unhed
39	06/08/201	1.0151	17/12/201	1.005	133	100	10,051	204	2	-200	208	10,259	Hedged
40	06/08/201	1.0151	18/03/201	0.99	224	256	9,895	280	2	-512	48	9,943	Hedged
41	07/09/201	1.0362	17/09/201	1.027	10	93	10,269	44	2	-186	-98	10,171	Unhed
42	07/09/201	1.0362	15/10/201	1.002	38	339	10,023	113	2	-678	-452	9,571	Unhed
43	07/09/201	1.0362	19/11/201	1.02	73	161	10,201	175	2	-322	28	10,229	Hedged
44	07/09/201	1.0362	17/12/201	1.005	101	311	10,051	213	2	-622	-196	9,855	Unhed
45	07/09/201	1.0362	18/03/201	0.99	192	467	9,895	309	2	-934	-316	9,579	Unhed
46	06/10/201	1.0202	15/10/201	1.002	9	179	10,023	129	2	-358	-100	9,923	Unhed
47	06/10/201	1.0202	19/11/201	1.02	44	1	10,201	218	2	-2	434	10,635	Hedged
48	06/10/201	1.0202	17/12/201	1.005	72	151	10,051	255	2	-302	208	10,259	Hedged
49	06/10/201	1.0202	18/03/201	0.99	163	307	9,895	360	2	-614	106	10,001	Hedged
50	06/10/201	1.0202	17/06/201	0.982	254	379	9,823	410	2	-758	62	9,885	Hedged
51	05/11/201	1.0054	19/11/201	1.02	14	-147	10,201	104	2	Unexercised	208	10,409	Hedged
52	05/11/201	1.0054	17/12/201	1.005	42	3	10,051	165	2	-6	324	10,375	Hedged
53	05/11/201	1.0054	21/01/201	0.998	77	75	9,979	215	2	-150	280	10,259	Hedged
54	05/11/201	1.0054	18/03/201	0.99	133	159	9,895	285	2	-318	252	10,147	Hedged
55	05/11/201	1.0054	17/06/201	0.982	224	231	9,823	335	2	-462	208	10,031	Hedged
56	06/12/201	1.0045	17/12/201	1.005	11	-6	10,051	71	2	Unexercised	142	10,193	Hedged
57	06/12/201	1.0045	21/01/201	0.998	46	66	9,979	135	2	-132	138	10,117	Hedged
58	06/12/201	1.0045	18/02/201	0.985	74	200	9,845	177	2	-400	-46	9,799	Unhed
59	06/12/201	1.0045	18/03/201	0.99	102	150	9,895	215	2	-300	130	10,025	Hedged
60	06/12/201	1.0045	17/06/201	0.982	193	222	9,823	300	2	-444	156	9,979	Hedged

Table 4.12: Summary of Table 4.11 (Importers- Second Strategy)

MONTH	HEDGING DURATION (DAYS	**% OF CASES WHERE HEDGED POSITION PERFORMED BETTER**
January 2010	9, 44, 72, 163, 254	**100%**
February 2010	14, 42, 70, 133, 224	**20%**
March 2010	14, 42, 77, 105, 196	**60%**
April 2010	11, 46, 74, 165, 256	**80%**
May 2010	16, 44, 72, 135, 226	**100%**
June 2010	11, 39, 74, 102, 193	**20%**
July 2010	9, 44, 72, 163, 254	**0%**
August 2010	14, 42, 70, 133, 224	**80%**
September 2010	10, 38, 73, 101, 192	**20%**
October 2010	9, 44, 72, 163, 254	**80%**
November 2010	14, 42, 77, 133, 224	**100%**
December 2010	11, 46, 74, 102, 193	**80%**
OVERALL % WHERE HEDGED POSITION PERFORMED BETTER IN 2010		**61.67%**

4.4.2.3 Third Strategy: Long Call and Short Put Options on USX with at the Money Exercise Price

Like the third hedging strategy for exporters, this strategy combines longing and shorting the option contracts for hedging purpose but in reverse side and targets the importers in lieu of the exporters. Tables 4.11 and 4.12 illustrate the fact that the synthetic strategy did not work very well for Canadian importers during 2010.

The results indicate that in only 10 out of 60 items (almost 16% of the cases), the hedged positions performed better than the unhedged positions. However, this strategy caused the total hedging costs to be reduced and sometimes eliminated. For instance, for going into the hedged position via this strategy in January, not only an importer has not paid any fee as insurance cost but also has received the amount of 68CADon average. According to item 1 of table 4.11, under the synthetic hedging strategy, an importer had to pay 50CAD for purchasing one call option and receive 120CAD for selling one put option. So the difference is the importer's benefit under this hedging. However, as the exchange rate decreased by the end of the hedging period and the purchased call option remained unexercised while the sold put option has been exercised. Therefore, the total portfolio of the importer decreased under the hedged position.

Among all the call options during 2010, only thirteen items have been exercised whereas forty seven items from the sold put options have been exercised. Disregarding the hedging periods, the worst months in 2010 for using the hedging strategy were February, June, July, August, September, and December while the best month was April as three out of five items gave positive results.

Table 4.13: Third Hedging Strategy for Canadian Importers (Synthetic Strategy)

Item	First Date	USD / CAD on First Date	Last Date	USD/CAD on Last Date	Duration (Days)	Foreign Exchange Gain/Loss on Import Contract (Unhedged Position)	**Final Value (Unhedged Position As Per Rate on Last Date)**	Premium for each Call Contract	Number of required Call contracts	Gain / Loss from Long Call Options	Premium for each Put Contract	Number of required Put contracts	Gain / Loss from Short Put Options	**Final Value (Hedged Position)**	**Comparison**
1	06/01/2	1.0390	15/01/201	1.0294	9	96	10,294	50	1	Unexercised	120	1	-96	10,268	Unhedged
2	06/01/2	1.0390	19/02/201	1.0452	44	-62	10,452	146	1	62	217	1	Unexercise	10,585	Hedged
3	06/01/2	1.0390	19/03/201	1.0123	72	267	10,123	209	1	Unexercised	279	1	-267	9,926	Unhedged
4	06/01/2	1.0390	18/06/201	1.0273	163	117	10,273	356	1	Unexercised	424	1	-117	10,224	Unhedged
5	06/01/2	1.0390	17/09/201	1.0269	254	121	10,269	470	1	Unexercised	530	1	-121	10,208	Unhedged
6	05/02/2	1.0647	19/02/201	1.0452	14	195	10,452	125	1	Unexercised	67	1	-195	10,199	Unhedged
7	05/02/2	1.0647	19/03/201	1.0123	42	524	10,123	210	1	Unexercised	149	1	-524	9,538	Unhedged
8	05/02/2	1.0647	16/04/201	0.9997	70	650	9,997	270	1	Unexercised	205	1	-650	9,282	Unhedged
9	05/02/2	1.0647	18/06/201	1.0273	133	374	10,273	380	1	Unexercised	307	1	-374	9,826	Unhedged
10	05/02/2	1.0647	17/09/201	1.0269	224	378	10,269	500	1	Unexercised	414	1	-378	9,805	Unhedged
11	05/03/2	1.0314	19/03/201	1.0123	14	191	10,123	100	1	Unexercised	65	1	-191	9,897	Unhedged
12	05/03/2	1.0314	16/04/201	0.9997	42	317	9,997	160	1	Unexercised	125	1	-317	9,645	Unhedged
13	05/03/2	1.0314	21/05/201	1.0598	77	-284	10,598	225	1	284	185	1	Unexercise	10,842	Hedged
14	05/03/2	1.0314	18/06/201	1.0273	105	41	10,273	275	1	Unexercised	220	1	-41	10,177	Unhedged
15	05/03/2	1.0314	17/09/201	1.0269	196	45	10,269	385	1	Unexercised	325	1	-45	10,164	Unhedged
16	05/04/2	1.0116	16/04/201	0.9997	11	119	9,997	60	1	Unexercised	103	1	-119	9,921	Unhedged
17	05/04/2	1.0116	21/05/201	1.0598	46	-482	10,598	125	1	357	169	1	Unexercise	10,999	Hedged
18	05/04/2	1.0116	18/06/201	1.0273	74	-157	10,273	170	1	157	209	1	Unexercise	10,469	Hedged
19	05/04/2	1.0116	17/09/201	1.0269	165	-153	10,269	285	1	153	310	1	Unexercise	10,447	Hedged
20	05/04/2	1.0116	17/12/201	1.0051	256	65	10,051	370	1	Unexercised	375	1	-65	9,991	Unhedged
21	05/05/2	1.0191	21/05/201	1.0598	16	-407	10,598	195	1	407	60	1	Unexercise	10,870	Hedged
22	05/05/2	1.0191	18/06/201	1.0273	44	-82	10,273	275	1	82	120	1	Unexercise	10,200	Unhedged
23	05/05/2	1.0191	16/07/201	1.0361	72	-170	10,361	320	1	170	170	1	Unexercise	10,381	Hedged
24	05/05/2	1.0191	17/09/201	1.0269	135	-78	10,269	410	1	78	250	1	Unexercise	10,187	Unhedged

25	05/05/2	1.0191	17/12/201	1.0051	226	140	10,051	520	1	Unexercised	340	1	-140	9,731	Unhedged
26	07/06/2	1.0631	18/06/201	1.0273	11	358	10,273	110	1	Unexercised	147	1	-358	9,952	Unhedged
27	07/06/2	1.0631	16/07/201	1.0361	39	270	10,361	210	1	Unexercised	225	1	-270	10,106	Unhedged
28	07/06/2	1.0631	20/08/201	1.0334	74	297	10,334	265	1	Unexercised	300	1	-297	10,072	Unhedged
29	07/06/2	1.0631	17/09/201	1.0269	102	362	10,269	335	1	Unexercised	345	1	-362	9,917	Unhedged
30	07/06/2	1.0631	17/12/201	1.0051	193	580	10,051	460	1	Unexercised	452	1	-580	9,463	Unhedged
31	07/07/2	1.0574	16/07/201	1.0361	9	213	10,361	140	1	Unexercised	126	1	-213	10,134	Unhedged
32	07/07/2	1.0574	20/08/201	1.0334	44	240	10,334	245	1	Unexercised	221	1	-240	10,070	Unhedged
33	07/07/2	1.0574	17/09/201	1.0269	72	305	10,269	300	1	Unexercised	273	1	-305	9,937	Unhedged
34	07/07/2	1.0574	17/12/201	1.0051	163	523	10,051	430	1	Unexercised	395	1	-523	9,493	Unhedged
35	07/07/2	1.0574	18/03/201	0.9895	254	679	9,895	535	1	Unexercised	480	1	-679	9,161	Unhedged
36	06/08/2	1.0151	20/08/201	1.0334	14	-183	10,334	225	1	183	30	1	Unexercise	10,322	Unhedged
37	06/08/2	1.0151	17/09/201	1.0269	42	-118	10,269	325	1	118	81	1	Unexercise	10,143	Unhedged
38	06/08/2	1.0151	15/10/201	1.0023	70	128	10,023	375	1	Unexercised	127	1	-128	9,647	Unhedged
39	06/08/2	1.0151	17/12/201	1.0051	133	100	10,051	465	1	Unexercised	204	1	-100	9,690	Unhedged
40	06/08/2	1.0151	18/03/201	0.9895	224	256	9,895	560	1	Unexercised	280	1	-256	9,359	Unhedged
41	07/09/2	1.0362	17/09/201	1.0269	10	93	10,269	131	1	Unexercised	44	1	-93	10,089	Unhedged
42	07/09/2	1.0362	15/10/201	1.0023	38	339	10,023	206	1	Unexercised	113	1	-339	9,591	Unhedged
43	07/09/2	1.0362	19/11/201	1.0201	73	161	10,201	275	1	Unexercised	175	1	-161	9,940	Unhedged
44	07/09/2	1.0362	17/12/201	1.0051	101	311	10,051	320	1	Unexercised	213	1	-311	9,633	Unhedged
45	07/09/2	1.0362	18/03/201	0.9895	192	467	9,895	442	1	Unexercised	309	1	-467	9,295	Unhedged
46	06/10/2	1.0202	15/10/201	1.0023	9	179	10,023	47	1	Unexercised	129	1	-179	9,926	Unhedged
47	06/10/2	1.0202	19/11/201	1.0201	44	1	10,201	144	1	Unexercised	218	1	-1	10,274	Hedged
48	06/10/2	1.0202	17/12/201	1.0051	72	151	10,051	198	1	Unexercised	255	1	-151	9,957	Unhedged
49	06/10/2	1.0202	18/03/201	0.9895	163	307	9,895	327	1	Unexercised	360	1	-307	9,621	Unhedged
50	06/10/2	1.0202	17/06/201	0.9823	254	379	9,823	470	1	Unexercised	410	1	-379	9,384	Unhedged
51	05/11/2	1.0054	19/11/201	1.0201	14	-147	10,201	70	1	147	104	1	Unexercise	10,382	Hedged
52	05/11/2	1.0054	17/12/201	1.0051	42	3	10,051	137	1	Unexercised	165	1	-3	10,076	Hedged
53	05/11/2	1.0054	21/01/201	0.9979	77	75	9,979	200	1	Unexercised	215	1	-75	9,919	Unhedged
54	05/11/2	1.0054	18/03/201	0.9895	133	159	9,895	286	1	Unexercised	285	1	-159	9,735	Unhedged
55	05/11/2	1.0054	17/06/201	0.9823	224	231	9,823	435	1	Unexercised	335	1	-231	9,492	Unhedged
56	06/12/2	1.0045	17/12/201	1.0051	11	-6	10,051	81	1	6	71	1	Unexercise	10,047	Unhedged
57	06/12/2	1.0045	21/01/201	0.9979	46	66	9,979	152	1	Unexercised	135	1	-66	9,896	Unhedged
58	06/12/2	1.0045	18/02/201	0.9845	74	200	9,845	205	1	Unexercised	177	1	-200	9,617	Unhedged
59	06/12/2	1.0045	18/03/201	0.9895	102	150	9,895	248	1	Unexercised	215	1	-150	9,712	Unhedged
60	06/12/2	1.0045	17/06/201	0.9823	193	222	9,823	410	1	Unexercised	300	1	-222	9,491	Unhedged

Table 4.14: Summary of Table 4.13 (Importers- Third Strategy)

MONTH	HEDGING DURATION (DAYS)	**% OF CASES WHERE HEDGED POSITION PERFORMED BETTER**
January 2010	9, 44, 72, 163, 254	**20%**
February 2010	14, 42, 70, 133, 224	**0%**
March 2010	14, 42, 77, 105, 196	**20%**
April 2010	11, 46, 74, 165, 256	**60%**
May 2010	16, 44, 72, 135, 226	**40%**
June 2010	11, 39, 74, 102, 193	**0%**
July 2010	9, 44, 72, 163, 254	**0%**
August 2010	14, 42, 70, 133, 224	**0%**
September 2010	10, 38, 73, 101, 192	**0%**
October 2010	9, 44, 72, 163, 254	**20%**
November 2010	14, 42, 77, 133, 224	**40%**
December 2010	11, 46, 74, 102, 193	**0%**
OVERALL % WHERE HEDGED POSITION PERFORMED BETTER IN 2010		**16.17%**

At the end of the chapter, a summary about the results of the analysis is reflected in the following graph.

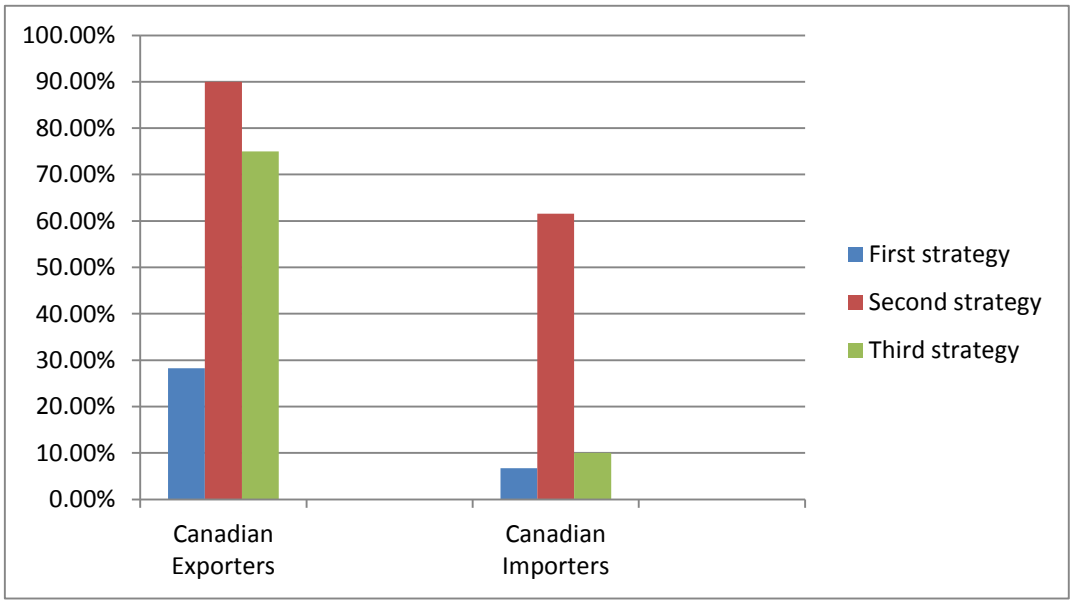

Figure 4.7: Graph of the Analyses Results

The above-mentioned graph depicts that all the hedging strategies applied with the use of foreign exchange option contracts on USX during the analysis period performed better for Canadian exporters comparing to Canadian importers. For both the assumed importers and exporters, the priority order was respectively the second strategy, the third strategy and lastly the first strategy. In 90% of the cases for the exporters, the hedged position under the third strategy was better than the unhedged position while the importers under the third hedging strategy could receive the desirable result in almost 60% of the cases. In less than 30% and 10% of the cases, the first hedging strategy performed better than the unhedged position for Canadian exporters and importers respectively. The second hedging strategy stands in the middle for both the importers and exporters.

Chapter 5

CONCLUSIONS

The thesis primarily endeavored to provide comprehensive information regarding foreign exchange market as well as the available financial instruments that are used by international traders of goods and services to hedge their currency risk. The study focused on currency options and aimed to analyze their effectiveness as hedging instrument for Canadian importers and exporters who dealt with U.S. dollar in 2010.

On one hand, single long put position, single short call position and synthetic position (simultaneous long put and short call) have been employed as three hedging strategies for Canadian exporters. On the other hand, single long call position, single short put position, and synthetic position (simultaneous long call and short put) have been employed as three hedging strategies for Canadian importers.

Five hedging periods have been assumed. That is to say nine to sixteen days (period 1), thirty eight to forty six days (period 2), seventy to seventy seven days (period 3), one hundred and one to one hundred and sixty five days (period 4), and eventually one hundred and ninety two to two hundred and fifty six days (period 5). Each period starts from 5th or 6th or 7th of each month during 2010. The final objective of the analysis was to compare hedged versus unhedged positions of the importers and exporters during the analysis periods.

For Canadian exporters, under the first single hedging strategy, namely single long put position, the results showed that in 28.33% of the cases, the hedged positions were better than the unhedged positions in terms of final value received. Beneath this strategy, January, April, May, August, and November were the worst months with effectiveness of 0% (in none of the cases, the hedged position was better than the unhedged position) whereas February and September were the best months with effectiveness of 80%. The second single hedging strategy, namely single short call position, produced excellent results with positive performance in 90% of the cases. Longer hedging durations such as the fourth and fifth periods provided better results. Minimum and maximum performances of the strategy were 60% and 100% respectively. The outcome of the analysis for the synthetic hedging strategy demonstrated that in 75% of the cases, the hedged positions were better than the unhedged positions. Except in March and April in which the effectiveness was 20%, in all other months the strategy performed well.

For Canadian importers, the first single hedging strategy, namely single long call position, did not perform well. Only in 6.67% of the cases, the hedged positions were better than the unhedged positions. These cases all relate to short hedging periods. That is to say, the first period (9 to 16 days) and second period (38 to 46 days). The second single hedging strategy, namely single short put position, performed relatively better. In 61.67% of the cases, the hedged positions were better than the unhedged positions. Except in July that none of the hedging periods gave the positive result (in none of the cases, the hedged position was better than the unhedged position), in other months there were some cases with positive results. Finally, the synthetic hedging strategy performed better than the unhedged positions in 16.17% of the cases. The worst results relate to the

months February, June, July, August, September, and December with effectiveness of 0% and the best results relate to April with effectiveness of 60%.

As the direction of movements of the USD/CAD exchange rate during the analysis period was mostly towards the depreciation of USD against CAD, all three hedging strategies provided better results for Canadian exporters when compared to Canadian importers during the same period. However, for both Canadian exporters and importers, the first single hedging strategy provided the lowest positive results while the second single hedging strategy provided the highest positive results. The results for the synthetic hedging strategy were in the middle (not low as the first strategy's result and not high as the second strategy' results).

Before doing such research, one would find the first hedging strategy, more logical than the second one to apply at first glance because there is not any potential loss for longing the options and moreover, the first strategy provides full hedging for the trader. However, the thesis results showed that due to expensive amounts of option premiums, the second strategy was more advantageous than the first one during the analysis period. Performance of the synthetic hedging strategy during 2010 was acceptable only for Canadian exporters.

The results can be also valuable for derivative traders and speculators in foreign exchange market. Taking into account that on one hand, the volatility of exchange rate between USD and CAD is not generally too much and on the other hand, the premiums of currency options are too high, shorting positions particularly for long durations have

higher probability of performing better. Based on the tables related to second single hedging strategies for both the exporters and importers, the highest results are pertaining to short positions in long period (period 5 that contains one hundred and ninety two to two hundred and fifty six days). Eighteen out of twenty four cases (75%) of the short positions provided the highest results among all three hundred and sixty hedging cases for the importers exporters.

The important point respecting this matter is that writing option contracts by an individual needs collateral. Therefore, in order to compute the effectiveness of such short positions, the time value of the required collateral should be also considered. Furthermore, the transaction cost has been disregarded in the analysis and the results are only valid for 2010.

For future studies, the thesis suggests that performances of future, forward, and swap agreements as alternative currency hedging instruments need to be analyzed and compared with that of currency options. With the purpose of enriching the value of the research, another proposition for future studies is to extend the scope of analysis that has been carried out in this research to a wider period of time (for instance from 2005 to 2012). Other hedging protection levels can be also studied with application of strike prices other than at the money prices.

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APPENDICES

Appendix A: Selected USD/CAD Exchange Rates in 2010 and 2011

Date	USD/CAD Exchange Rate	Date	USD/CAD Exchange Rate
06/01/2010	1.0390	06/08/2010	1.0151
15/01/2010	1.0294	20/08/2010	1.0334
05/02/2010	1.0647	07/09/2010	1.0362
19/02/2010	1.0452	17/09/2010	1.0269
05/03/2010	1.0314	06/10/2010	1.0202
19/03/2010	1.0123	15/10/2010	1.0023
05/04/2010	1.0116	05/11/2010	1.0054
16/04/2010	0.9997	19/11/2010	1.0201
05/05/2010	1.0191	06/12/2010	1.0045
21/05/2010	1.0598	17/12/2010	1.0051
07/06/2010	1.0631	21/01/2011	0.9979
18/06/2010	1.0273	18/02/2011	0.9845
07/07/2010	1.0574	18/03/2011	0.9895
16/07/2010	1.0361	17/06/2011	0.9823

Appendix B: Selected Call and Put Quotations During 2010 and 2011

Date	put option (Bid price)	put option (Ask price)	call option (Bid price)	call option (Ask price)	Date	put option (Bid price)	put option (Ask price)	call option (Bid price)	call option (Ask price)
06/01/2010	1.20	1.27	0.45	0.5	07/07/2010	1.26	1.9	0.57	1.4
06/01/2010	120	2.22	1.41	1.46	07/07/2010	2.21	2.9	1.56	2.45
06/01/2010	279	2.85	2.04	2.09	07/07/2010	2.73	3.4	2.11	3
06/01/2010	4.24	4.29	3.51	3.56	07/07/2010	3.95	4.65	3.41	4.3
06/01/2010	5.3	5.35	4.65	4.7	07/07/2010	4.8	5.5	4.45	5.35
05/02/2010	0.67	0.75	1.17	1.25	06/08/2010	0.3	0.8	1.57	2.25
05/02/2010	1.49	1.55	2	2.1	06/08/2010	0.81	1.2	2.15	3.25
05/02/2010	2.05	2.15	2.56	2.7	06/08/2010	1.27	2.8	2.66	3.75
05/02/2010	3.07	3.25	3.57	3.8	06/08/2010	2.04	3.55	3.56	4.65
05/02/2010	4.14	4.3	4.67	5	06/08/2010	2.8	4.35	3	5.6
05/03/2010	0.65	0.95	0.7	1	07/09/2010	0.44	0.54	1.25	1.31
05/03/2010	1.25	1.55	1.3	1.6	07/09/2010	1.13	1.25	2.01	2.06
05/03/2010	1.85	2.15	1.95	2.25	07/09/2010	1.75	1.86	2.7	2.75
05/03/2010	2.2	2.65	2.3	2.75	07/09/2010	2.13	2.25	3.14	3.2
05/03/2010	3.25	3.7	3.4	3.85	07/09/2010	3.09	3.29	4.28	4.42
05/04/2010	1.03	1.35	0.34	0.6	06/10/2010	1.29	1.36	0.41	0.47
05/04/2010	1.69	2	0.99	1.25	06/10/2010	2.18	2.25	1.38	1.44
05/04/2010	2.09	2.4	1.41	1.7	06/10/2010	2.55	2.71	1.8	1.98
05/04/2010	3.1	3.45	2.49	2.85	06/10/2010	3.6	3.77	3.1	3.27

05/04/2010	3.75	4.1	3.32	3.7	06/10/2010	4.1	5.05	3.7	4.7
05/05/2010	0.6	0.9	1.5	1.95	05/11/2010	1.04	1.13	0.62	0.7
05/05/2010	1.2	1.5	2.15	2.75	05/11/2010	1.65	1.73	1.3	1.37
05/05/2010	1.7	1.95	2.65	3.2	05/11/2010	2.15	2.28	1.85	2
05/05/2010	2.5	2.8	3.55	4.1	05/11/2010	2.85	2.99	2.7	2.86
05/05/2010	3.4	3.65	4.6	5.2	05/11/2010	3.35	4.35	3.4	4.35
07/06/2010	1.47	2.05	1.01	1.1	06/12/2010	0.71	0.77	0.75	0.81
07/06/2010	2.25	2.8	1.81	2.1	06/12/2010	1.35	1.41	1.45	1.52
07/06/2010	3	3.5	2.59	2.65	06/12/2010	1.77	1.87	1.95	2.05
07/06/2010	3.45	3.95	3.07	3.35	06/12/2010	2.15	2.24	2.4	2.48
07/06/2010	4.52	5.3	4.25	4.6	06/12/2010	3	3.55	3.25	4.1