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Strategies for Minimizing Monetary Loss in the Department of Defense Budget through Use of Financial Derivatives

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STRATEGIES FOR MINIMIZING MONETARY LOSS IN THE DEPARTMENT

OF DEFENSE BUDGET THROUGH USE OF FINANCIAL DERIVATIVES

THESIS

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AFIT/GIR/ENV/08-M05

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AFIT/GIR/ENV/08-M05

STRATEGIES FOR MINIMIZING MONETARY LOSS IN THE DEPARTMENT OF DEFENSE BUDGET THROUGH USE OF FINANCIAL DERIVATIVES

THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Information Resource Management

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March 2008

AFIT/GIR/ENV/08-M05

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DEPARTMENT OF DEFENSE BUDGET THROUGH USE OF

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AFIT/GIR/ENV/08-M05

Abstract

The purpose of this research was to examine whether it would be in the best interest of the Department of Defense to consider using currency hedging as a way to protect its budget from negative currency fluctuations in the US Dollar. Specifically, the use of futures and options contracts was examined. Overseas expenditure data was collected on the YEN and the EURO for Fiscal Years 2001 to 2007 and cross-referenced with the contract prices for the aforementioned hedges during the same period of time. Using an ex post facto analysis with the gathered data, the results show that hedging with futures or call options on the USD/EURO would have provided a tremendous overall savings to the DOD. Currently the DOD does not hedge its budget against currency fluctuation. The implication from this study is that the DOD should consider hedging its currency exposure and examine whether other methodologies might be more appropriate with other currencies or in other circumstances.

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STRATEGIES FOR MINIMIZING MONETARY IN THE DEPARTMENT OF DEFENSE BUDGET THROUGH USE OF FINANCIAL DERIVATIVES

I. Introduction

Overview

Each year the United States Department of Defense spends billions of dollars overseas in various locations throughout the world. (GAO-05-800R) This money is spent on maintenance of bases, housing of military personnel and their families, hiring local workers, and logistics, just to name a few. These expenses, while vital to the interests of the United States, are becoming increasingly expensive due to the devaluation of the USD relative to the other currencies of the world. This paper is an examination of some of the strategies currently available in the marketplace, which can help mitigate the effects of a depreciating dollar.

Background

The currency markets of the world fluctuate on a daily basis. As a result, one currency may appreciate or depreciate relative to the value of another given currency. These fluctuations result from trade imbalances, differences in interest rates, governmental policies and economic productivity, just to name a few of the many factors. The result over time is that the purchasing power of one currency can either increase or decrease in comparison to another.

Over the course of the last several years, the DOD has lost hundred of millions of dollars due to the declining value of the U.S. Dollar, relative to the currencies of other countries in which the DOD expends funds. (GAO-05-800R) According to the DOD Budget Accounts Listing Total Obligational Authority, Budget Authority, and Outlays reports for Fiscal Years 2002 to 2006, the total additional spending required as a result of a devalued USD was $559MM in 2002, $607MM in 2003, $54MM in 2004, $444MM in 2005, and $478MM in 2006 for a total increase in spending of $2.142 billion. Part of this problem is attributable to the fact that the current budgetary cycle used by the DOD requires forecasting of expected budgets and currency exchange rates, two years in advance of the actual expenditure of funds. Because the expected future exchange rates and the actual spot rates can fluctuate a great degree this creates uncertainty for the DOD. In addition to not knowing whether the USD will buy more or less two years in the future, research shows that for the past several years, the value of the USD has declined significantly relative to other world currencies. (Dapice 2005) To better illustrate this, Table 1 and Table 2 show the relationship of the USD/EURO and USD/YEN over a ten-year period as a general overview. Both charts were obtained with permission from www.kitco.com.

Figure 1

7 Year USD vs. EURO
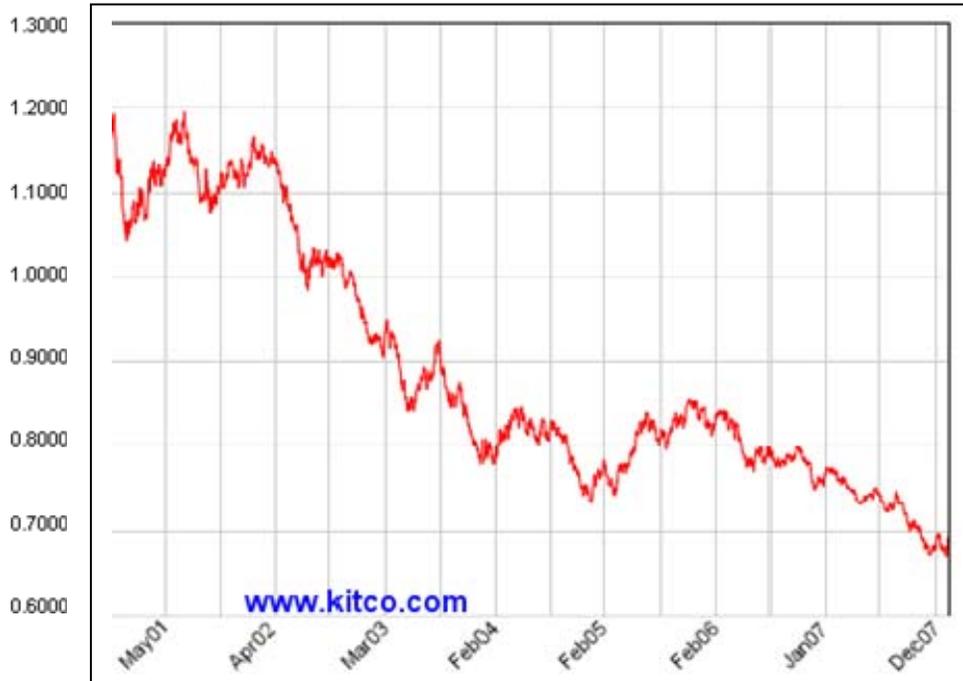
What is notable in this chart is the decline in value of the USD relative to the

EURO since 2001. The EURO is a fairly new currency and in the early years of its

creation, not as many countries utilized the EURO as we have today. The net result is

that demand for the EURO has continued to increase as more member countries are being

added to the EU and adopting the EURO.

Figure 2

7 Year USD vs. Yen
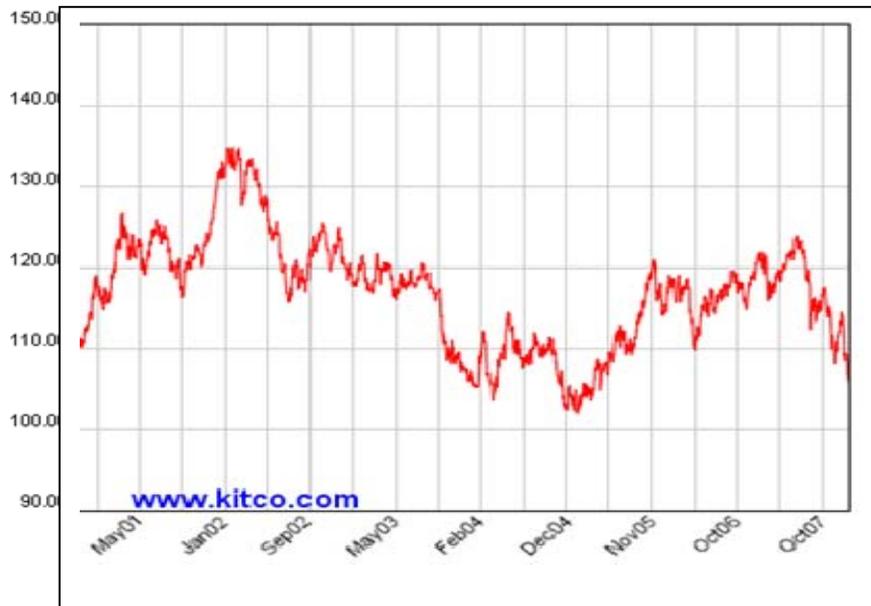
While the EURO is the currency utilized by many countries in the European Union, the Japanese YEN is utilized by only one country. This chart showcases the fluctuating exchange rate for the past seven years between the USD and the YEN.

To help alleviate the pressure of fluctuating currency values, the DOD currently uses a three-year, weighted average of the exchange rate in an attempt to forecast future exchange rates. Correspondingly, DOD maintains a Foreign Currency Fluctuation Account (FCFA) designed to provide extra funds to cover the difference between budgeted exchange rates and actual exchange rates. When a surplus is realized on a currency trade, these extra funds are added to the FCFA coffers. Likewise, when a negative currency trade is made, funds are distributed from the FCFA to cover the loss. Even if the USD should appreciate in value relative to other currencies, a problem still

remains – budgeting uncertainty. This uncertainty is due to the fact that the there are currently no known models available to accurately predict the exact exchange rate of currencies in the future. As a result, the DOD is unable to accurately know how much money will be required in its budget for future overseas expenditures. Just as DOD decision makers want to know with certainty that a specific weapon system will perform as expected at any given date in the future, the need for these decision makers to know their budgets will be adequate at any given time in the future is also critical to effectively operating a military.

In the corporate world, the influences of these currency fluctuations have been minimized through the use of various financial derivatives: namely, futures contracts, swaps, forward contracts, and options on futures. Another method utilized by Multi-National Corporations is the use of operational hedges in addition to financial hedges. According to a paper published by David Carter, Christos Patzalis and Betty Simkins in 2003 MNCs can hedge their risk to fluctuations in the foreign currency markets by using financial hedges (options, futures, etc) or by using operational hedges such as moving cost centers or centers of production to another country. (Carter, Patzalis and Simkins 2003) While the use of operational hedging in the corporate world may be viable, it may not always be practical in the DOD. Because of the unique role and purpose of the DOD, it may not be practical to move operations simply due to risks related to foreign currency exposure.

One of the challenges to this study is that there is little existing research in using these techniques for a non-profit organization. While studies on the use of derivatives by non-profits may be limited, there is some information available in company annual

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reports. The International Committee of the Red Cross (ICRC), based in Geneva, does make use of derivatives to hedge against currency fluctuations. According to the Consolidated Financial Statement of the ICRC 2006, page 379, "The ICRC's foreign operations are considered an integral part of the operations in Geneva. The assets and liabilities of those operations are translated into Swiss francs at foreign exchange rates ruling at the dates of the transactions." The report further states that the derivatives they commonly use to hedge against currency fluctuation are forward contracts and swaps. (ICRC 2006)   While the annual report mentions the use of these derivatives, it does not explain what are the results of these transactions.

Much of the theory and practice in today's for-profit organizations is not only to mitigate loss due to currency fluctuations, but also to use various financial derivatives to generate profit. Because the Department of Defense is a non-profit organization, the focus of this paper will be limited to loss mitigation.

Problem Statement

Due to the fluctuations in the world currency markets and the decline of the USD for the past several years, the DOD has had to allocate extra resources to cover these unexpected costs of doing business.

Purpose and Research Question

The primary purpose of this research is to assess the practicality of utilizing some of the financial derivative products available on the market today in an effort to mitigate losses due to the declining value of the USD and to build stability in the DOD budgetary process.

Methodology

This research utilizes an ex post facto methodology. Data has been gathered from the 2001 to the 2007 fiscal year DOD budget to compare the budgeted exchange rates vs. the actual exchange rates. In addition, data has been collected on the cost of the various financial derivatives throughout the same time period. This data will be used to examine what would have been the result had the DOD utilized futures contracts or options on futures contracts as a currency hedge in its budget.

Significance

The significance of this research is that by potentially mitigating the losses due to the devaluation of the USD, there is the potential for millions of dollars in annual savings (GAO-05-800R), which can be used to fund other critical projects throughout the DOD.

Assumptions/Limitations

The limitations of performing an ex post facto analysis is whether or not a direct causal statement can be made that the implementation of various financial derivative instruments will lead to budgetary stability and savings for the DOD in the future. It is assumed that the world markets contain enough liquidity to allow DOD entry into these markets without significantly influencing the price of the underlying derivative.

In an effort to better understand hedging options and strategies along with the risk management principals that underlie such strategies, a review of some key hedging products is in order. The first item examined is risk mitigation, followed by the use of futures. Next are forward contracts. Finally, options on futures contracts will be discussed.

II. Literature Review

Risk Mitigation

To put it simply, one of the primary purposes of using derivatives to hedge currency transactions is for risk mitigation. In a journal article written by Dr. Rene Stulz, the editor of the *Journal of Finance*, the author examines the differences between modern financial theory and what is observed in actual corporate practice as it applies to hedging. According to Dr. Stulz, modern financial theory suggests that hedging is designed to minimize variance; however, much of the actual hedging that happens in the marketplace is designed for the "elimination of costly lower-tail outcomes -- that is to reduce the expected costs of financial trouble while preserving a company's ability to exploit any comparative advantage in risk-bearing it might have." (Stulz 1996, pg. 8)

As an example of what can happen when a company chooses not to hedge its currency risks, Stulz cites the example of Daimler-Benz in 1995. (Stulz 1996) It was at this time the company reported a first-half loss of DM 1.56 Billion in losses, which was the largest loss in the company's 109-year history. The company attributed this loss to the weakening USD, which had declined in value to the DM by 14 percent during the same period of time. By refusing to hedge against what Dr. Stulz would describe as "costly lower-tail outcomes" Daimler Benz realized significant losses.

Another example of a corporation employing currency-hedging practices as a way to minimize the negative implications as a result of the decline in the value of the USD is

seen with Merck & Co. In a 1989 article by Judy Lewent and John Kearney, employees of Merck & Co., the authors mention that this multi-national pharmaceutical company was under increasing pressure to maintain its competitive advantage in the global marketplace. One key area they examined was in the use of currency hedging. (Chew 2001) As a result of their research, Lewent and Kearney developed a five-step process which included: exchange rate forecasting, analysis of the impact to overall strategic plan, hedging rationale, choosing which financial instruments to use, and how to implement the hedging program. After determining the need for a currency hedging program, the company began working with Professor Darrell Duffie of Stanford University to develop a computer model to determine the effectiveness of various hedging strategies using a Monte Carlo simulation. For proprietary reasons, the authors did not provide the exact details of their hedging program other than mention the preference for options contracts utilizing various strike prices and expiration dates. They mention their methodology of hedging (as is in line with Dr. Stulz' theory on avoiding costly lower-tail outcomes) was designed to mitigate the negative impact of USD devaluation, rather than as a way to minimize variance. (Chew 2001)

Currency exchange rate risk is part of the overall enterprise risk management which corporations need to examine. (Nocco and Stulz 2006) "Through hedging, firms can eliminate their exposure to many risks at low cost. For instance, a foreign exchange hedging program utilizing forward contracts has typically very low transaction costs. When hedging is cheap, there is no good economic reason for a firm not to hedge economic risks if it faces the possibility of cash flow shortfalls that could force it to give up valuable projects. Through hedging, the firm incurs small costs but increases the

probability that it will be able to implement all positive net present value projects available to it." (Nocco and Stulz 2006)

Despite the benefits achieved by hedging one's currency transactions, another question arises which is how much of percentage should a company hedge its currency risks? In a 1992 survey conducted by Walter Dolde of the Fortune 500 companies and cited in Dr. Stulz' article, almost 90 percent of respondents said they estimate their hedging ratios based on their expectations of future FX moves. (Stulz 1996) In other words according to this study, the respondents were more likely to hedge 20 percent or less of their currency exposure if they expected currency movements to move favorably for their company. On the other hand, if these same respondents believed there was greater potential in a negative currency move, they might be more inclined to hedge up to 100 percent of their currency exposure.

Simply said, the extent to which one's currency exposure is hedged is directly related to the prognostications of the managers whose job it is to hedge said risk. For example, if the currency manager for a US-based company believed that the USD would appreciate relative to a currency in which his company was to trade, then he would likely be more inclined to hedge a smaller portion of that exposure, if at all. His expectation is that the USD will appreciate and provide an additional profit. On the other hand, if the same manager expected the opposite scenario, it would be reasonable for the opposite transactions to occur. Lastly, if the same manager was somewhere in the middle on whether the USD was to appreciate or depreciate, he would likely engage in a hedge that reflected his estimation

The concept that risk mitigation is important to a corporation is clearly seen throughout literature on the topic. Hedging currency exposure is one of the ways a company can minimize its risks. Now we will examine some of the tools used in the marketplace today to provide a hedge for currency.

Futures Contracts

A futures contract is simply an agreement between two parties to conduct a transaction at a future date, at a specified price. (CME 2006) While this type of arrangement may have been happening throughout human history for thousands of years, it was not until 1848 when an official exchange was created in the United States to provide an open market for such trading.

Futures were originally developed to help create equilibrium for both the buyers and sellers of commodity products. Because of market dynamics, farmers were unable to get a high price for their product, such as corn, in the months immediately following the harvest. By the same token, buyers of these products had to pay a hefty premium if they wanted to purchase these products out of season. The net result was a large variance in prices for certain goods depending on the season and availability of these goods. (CME 2006)

With the creation of the Chicago Board of Trade (CBOT) and the Chicago Mercantile Exchange (CME), farmers and consumers had an organized market in which to arrange the price, quantity and future date of the transaction. For example, if a farmer wanted to guarantee he would receive $100/ton for corn with a scheduled delivery in the month of August, he could go to the CBOT and try to find a buyer who would agree to

such terms. Because the CBOT provided a market in which many farmers and consumers could come together and bid for various products, prices and delivery dates, prices became much more stable. The added benefit for each party in the transaction was to know in advance the exact price each would pay or receive for the underlying commodity.   This provided a great deal of stability. Farmers could now know how much they could expect to earn before they even planted, while consumers could know in advance what their costs were going to be. (CME 2006) To mitigate the risk of default by either the buyer or seller, each party has to provide a partial payment to a neutral third party that acts as an escrow agent.

Today, exchanges such as the CBOT exist throughout the world. They continue to provide a market for farmed products such as coffee, corn, orange juice, cattle, etc. However, these markets have grown to also include financial products. (CME 2006) Futures on indexes such as the S&P 500 and on the currencies of several countries now exist. The principles that were behind the creation of the original futures markets are now being applied to the world of finance.

These futures contracts on currency can also help stabilize unexpected imbalances. For example, if Company A in the United States knows it will make a purchase of automobiles from Company B in Germany next October, but believes that the value of the USD will decline compared with that of the EURO, then Company A can purchase an October futures contract on the EURO in the open market. This gives Company A the ability to trade USD for EUROs at a pre-set exchange rate in October and then use those EUROs to pay the German manufacturer.

One of the advantages to the futures market is that futures are traded on an open exchange and provide a great deal of liquidity. (CME 2006) If any party to a transaction wishes to exit the position, that party simply makes an opposite transaction. Utilizing the previous example, Company A could decide to sell a futures contract for the same amount with the same expiration. The result is a net cancellation of the contract. Another advantage is that futures contracts are traded in a similar manner as stocks are traded on a stock exchange; that is, the buyer and seller do not know each other, nor do they necessarily care. These parties are simply concerned about either buying or selling the underlying entity. This is a result of the enormous liquidity available by having a large pool of both buyers and sellers**.** (CME 2006)

Upon liquidation of a futures contract two alternatives are available – cash settlement or physical delivery. "A party to a futures contract has two choices on liquidation of the position. First, the position can be liquidated prior to the settlement date. For this purpose, the party must take an offsetting position in the same contract. For the buyer of a futures contract, this means selling the same number of identical futures contracts: for the seller of a futures contract, this means buying the same number if identical futures contracts. The alternative is to wait until the settlement date. At that time the party purchasing a futures contract liquidates the position by delivering the underlying at the agreed-upon price. For some futures contracts, settlement is made in cash only. Such contracts are referred to as cash-only settlement contracts." (Fabozzi and Peterson 2003, pg. 85)

One of the disadvantages to the futures market is that the size of the contracts is standardized and may not fit all situations. For example, one contract on soybeans is

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equal to 5,000 bushels. (CBOT 2007) If someone does not need that many bushels, then futures contracts may not work very well. Another disadvantage is that the delivery dates are also standardized. Again, if an individual has need for delivery in a month that does not fall in one of the standardized months, then the futures market may not be a satisfactory method of trading. (CME 2006)

Forward Contracts

According to the book *Analysis of Derivatives for the CFA Program* by Don M. Chance, Ph.D., "A forward contract is an agreement between two parties in which one party, the buyer, agrees to buy from the other party, the seller, an underlying asset or other derivative at a future date at a price established at the start of the contract." (Chance 2003, pg. 26) Forward contracts are similar to futures contracts; the major difference is that they are traded in the over-the-counter market and are direct agreements between two entities. (CME 2006) The advantage to the forward contract market is that the details of the contract can be custom tailored to the needs of the two parties when it comes to size of contract and delivery date. The disadvantage lies in the fact that because these contracts are customized, there is less liquidity in the market in the event either party wishes to buy or sell their portion of the contract.

Using the previous example, Company A may plan to purchase a fixed number of vehicles from Company B, requiring a payment in EUROs. Rather than using the open market to purchase a futures contract on the EURO, Company A may instead deal directly with Company B and agree in advance on the date of the exchange, the amount that is to be exchanged, and the exchange rate to be used. This direct deal can be

advantageous to both parties, but because they do not use an intermediary exchange, the risk of default by one or both parties is increased. In addition, if Company A wishes to get out of the deal, it must try to find someone who will purchase their portion of the contract. If another company purchased Company A's contract, then the new company would be obligated to the same terms and conditions originally stipulated. (CME 2006)

Options on Futures

The Chicago Mercantile Exchange, as do many other exchanges, offers another alternative for individuals or companies seeking to find a way to hedge against the risks of currency fluctuations – options on futures contracts. According to CME 2006 pg. 81 "these contracts offer the buyer the right, but not the obligation, to buy or sell an underlying futures contract at a particular price." By having the "right, but not the obligation" to buy or sell the futures contract, the risk to the buyer is dramatically reduced. For example, when using a standard futures contract, the risks can be enormous. For example let us say the current USD was worth one EURO and a futures contract specified an equal one-for-one exchange rate at some date in the future. Now let us assume that the current spot exchange rate at the time of the contract expiration was actually one USD for five EUROs. The EURO is now one-fifth the value of the USD. The person or company who had agreed to a futures contract on a one-for-one basis would pay (in USD) five times the going exchange rate, while the person on the other side of the transaction would receive five times the value for the same amount of goods. This is one of the hazards of trading in the futures or forward market.

For this reason, options on futures were created. If we continue using this same scenario, but this time the buyer purchased an option instead of a futures contract, the buyer would have the ability to decide whether or not to exercise his right to trade at the agreed futures exchange rate, or to simply let the option contract expire and trade at the current market spot rates. (CME 2006) By selling the option for whatever value, if any, still remained or simply letting it expire and then trading the currency on the open market, the buyer of the option would limit his losses to the costs of the transaction.

Because of the ability to guarantee a buyer's downside to risk, while at the same time providing room for upside appreciation, options are priced at a premium to either forward or futures contracts. (CME 2006) In other words, the buyer of the option knows at the time of purchase what the maximum costs of the transactions will be. For example, if the buyer purchases a USD/EURO option that guarantees an exchange rate of 1.40 EUROS by the time of expiration and the premium cost on the transaction brings the realized rate of exchange to 1.45 EUROS. Now assume that by the time of expiration of the contract the spot rate for USD/EURO is 1.6 EUROS. The buyer of the option in this scenario is protected from the higher spot rate because he has a contract guaranteeing an exchange rate of 1.40 EUROS. If on the other hand, the spot rate were to drop to 1.25 EUROS, it would not make sense for the option buyer to agree to pay 1.4 EUROS when the market rate was only 1.25 EUROS. In this instance, assume the buyer allows the option to expire worthless and instead trades the currencies at the spot rate. Though the spot rate is only 1.25 EUROS, the premium for the option must also be included which brings the effective exchange rate to 1.30 EUROS. While the option buyer still realized a loss over the going spot rate, his downside potential is only .05 EUROS.

Real World

Corporations throughout the world use various currency derivatives as both a means to hedge against currency fluctuations and as a means for speculating in an effort to increase profits. Many of these companies view their exact strategies as proprietary and are not inclined to disclose detailed information on each trade. However, it is helpful to examine the overall results these companies realize when utilizing these derivatives.

One such company is Coca-Cola Enterprises, Inc. According to the company's 2006 Annual Report, page 31, it earned $211MM as a result of currency fluctuations while it cost $28MM to transact these currency hedges for a net gain of $183MM. In 2005, the company lost $303MM on currency fluctuations which was offset by $54 MM gain from hedging for a net loss of $249MM. Finally, in 2004, the company realized a gain of $305MM on its currency transactions while spending $28MM on hedging activities bringing the total gain from currencies to $277MM. (CCE2006) The company also stated on page 47 of the CCE2006 Annual Report that they use currency derivatives to limit the impact currency fluctuations has on its earnings.

"We, at times, use interest rate swap agreements and other financial instruments to manage the fluctuation of interest rates on our debt portfolio. We also use currency swap agreements, forward agreements, options and other financial instruments to minimize the impact of currency exchange rate changes on our nonfunctional currency cash flows and to protect the value of our net investments in non-U.S. operations. All derivative financial instruments are recorded at fair value on our Consolidated Balance

Sheets. We do not use derivative financial instruments for trading or speculative

purposes." (CCE2006) While Coca-Cola Enterprise's Annual report shows that the use

of derivatives to hedge against currency fluctuations is not without cost or risk of loss,

this company shows its belief on the stabilizing effects to its balance sheets that can be

achieved through the use of these hedges.

Another company that employs currency hedging is Microsoft. According to the

Microsoft Corporation Annual Report 2007, page 20, the company realized a gain of

$248MM in revenue growth over the previous year as a result of foreign currency

exchange rates. (MSFT 2007) As part of its currency hedging strategy, Microsoft makes

use of options contracts. According to Microsoft Corporation Annual Report 2007, page

32, "We are exposed to foreign currency, interest rate, fixed-income, equity, and

commodity price risks. A portion of these risks is hedged, but fluctuations could impact

our results of operations, financial position, and cash flows. We hedge a portion of

anticipated revenue and accounts receivable exposure to foreign currency fluctuations,

primarily with option contracts. We monitor our foreign currency exposures daily to

maximize the overall effectiveness of our foreign currency hedge positions. Principal

currencies hedged include the euro, Japanese yen, British pound, and Canadian dollar."

While 2007 was a profitable year for Microsoft when it came to managing their

currency risks, the years 2004 to 2006 were not as favorable. According to Microsoft

Corporation Annual Report 2006, page 32, the company had a net loss in 2004 of

$284MM on its foreign currency contracts. In 2005 they brought the loss down to

$53MM and in 2006 the loss on foreign currency contracts was $313MM. (MSFT 2006)

The report attributes some of these loses due to "higher net losses in time value on

foreign exchange contracts used to hedge anticipated foreign currency revenues…"

Despite these losses, however, it is not stated what the gains or losses would have been

had hedging not been utilized.

This section has provided some background information on a few of the

derivatives products available on the market today, while showing their perceived

importance by some of the world's largest organizations. Next is an examination of the

methodology used to study what would have been the results had the DOD implemented

currency hedging in the FCFA as a way to mitigate loss.

Studies and Legal Issues

One of the difficulties in researching this topic is the lack of previous work on this

specific area. Copious amounts of material have been postulated regarding hedging

theory, risk analysis, and hedging in the corporate environment; however in the realm of

non-profit organizations and the US Federal Government, little work is available.

However, there is one 1998 study that was published in 2000 which addresses this very

topic. (Groshek and Felli 2000)

The authors, Gerald Groshek and James Felli, used a Monte Carlo simulation to

test the results of hedging the Air Force Overseas Operations and Maintenance budget in

the Japanese Yen, Great British Pound, and German Mark. The hedging methods chosen

by these authors included the use of forward and options contracts. The data collected by

the authors extended from 1985 to 1998. According to the simulation, there would be an

approximate six to seven percent savings using these hedging methods. (Groshek and

Felli 2000) The authors conclude that it would be in the best interest of the DOD to

utilize hedging and seem to indicate a preference for the use of options as it provides an additional level of protection.

Even with the positive results of this simulation, the authors conclude that the implementation of a hedging strategy was not possible at the time due to limitations in DOD regulations. However, according to Department of Defense Financial Management Regulation, Volume 5, Chapter 12, page 9, "Foreign currency is not purchased by forward contracts directly from foreign governments, private firms or individuals at a negotiated rate without prior authorization from the U.S. Treasury. All requests for authorization must be submitted through the Financial Services and Disbursing Division." (DOD7000.14-R) The very next sub-point mentions, "Speculation in foreign currency is prohibited."

What is interesting to note is that this stipulation only references forward contracts, not futures or options contracts. Whether this is simply a technical loophole is a matter for debate. Even should futures and options contracts be interpreted to fall along the same guidelines as a forward contract, the regulation does clearly state that contracts (specifically forwards) such as these are allowed, provided prior approval was obtained from the US Treasury. The next prohibition against speculation in foreign currency is also arguably debatable. The definition of what constitutes "speculation" is not provided. What is clear from the regulation is that engaging in currency hedging is not strictly prohibited, and as such could very well be a viable option for the DOD.

It is this author's opinion that the conclusion of this study shows that currency hedging can be a prudent measure to protect DOD's financial assets. As such, a

clarification in DOD7000.14-R needs to be made to specifically allow the considered use of hedging.

III. Methodology

Measures

The data for the currency fluctuation portion of the DOD budget was obtained from the monthly Currency Fluctuation Reports produced by the Office of the Secretary of Defense, Comptroller at http://www.defenselink.mil/comptroller/fcfrprior.html. The data collected is the monthly currency fluctuation reports from the beginning of fiscal year 2001, ending with fiscal year 2007. The data shows the DOD projected and budgeted currency rates and the actual currency rates for nine different currencies in which the DOD conducts transactions. It is assumed that the data provided in these official government reports are accurate.

Data for the cost of trading the underlying financial derivatives (EURO and YEN futures and options) were obtained from the *Chicago Mercantile Exchange* for the same time period. It is also assumed that this data is accurate.

Of all the currencies in which the DOD executes transactions, the two currencies examined in this analysis are the EURO and the YEN. The single largest currency expenditure in the DOD is the EURO. (SEPT_1506) The reason for the selection of the YEN is that it is also heavily utilized by the DOD and should help to provide a balance to the analysis by including another region of the world. Other currencies in which the DOD trades were not included for sake of simplicity and the fact that there are not sufficient market resources (in some cases) to hedge each of these individual currencies

to the same extent as the EURO and the YEN. However, new currency trading pairs are being developed continuously and should the US express an interest in developing a futures/options market for specific currency, it should not be very difficult.

The data for the total expenditures in the EURO and the YEN were taken from the Foreign Currency Fluctuations, Defense Report, DDCOMP_1506, for Operations and Maintenance, Military Construction, Overseas Family Housing Operations and Maintenance, and Overseas Family Housing Construction. While these four categories do not necessarily represent every USD spent by the DOD overseas, they do capture a large percentage of the budgeted expenditures in both the EURO and the YEN. In examining the FY 2007 budget, the total expenditures in these four categories totaled $7,574,647,000 of which the EURO and YEN constitute 71.3 percent of this total. According to the National Defense Budget Estimates for FY 2007, also known as the Greenbook, the total DOD budget for that year was $463,025,000,000. Of the $463B spent that year, the EURO and YEN expenditures, as measured by this study, compromise 1.167 percent of the total DOD budget.

The derivatives chosen for this analysis are futures and options contracts. Other methodologies such as swaps and forward contracts, while possibly viable alternatives, are not within the scope of this analysis. For the options, call contracts were chosen rather than put contracts. Because the DOD is a federal agency and a not-for-profit organization, call options were chosen as a way to hedge against a decline in the USD; any profit from the trade could be viewed as happenstance. On the other hand, purchasing puts on the USD could be viewed by some as a way to profit on the

appreciation of the USD rather than as a hedge against its decline, and as such might not be looked upon favorably by the taxpaying community.

In reality a put and a call can be thought of as mirror images of each other, depending on the position (long or short) on the trade. Call options were chosen as a hedge against the declining value of the USD. In an environment in which the USD increases in value relative to another currency, going long a put option might make more sense from a profitability standpoint. However, either puts or calls could have been used to achieve similar results depending whether the buyer was long or short the trade. A person could buy a call option on the USD/EURO or reverse the trade and purchase a put on the EURO/USD to likely achieve similar results. Both calls and puts have their uses and either could have been chosen for this study. It is the author's opinion that call contracts might appear to be less of a "speculative" hedge in the eyes of the public and it was for this reason call contracts were chosen.

The actual trading costs for both the futures and derivatives have not been included for sake of simplicity. As an example, to cover $4B USD/EURO contract would cost approximately USD $2,300 for the entire trade, according to the CME. The dealer realizes a profit on the spread between the Bid and Ask price, not on the actual transaction costs.

The first trading day of October (typically October 1) was chosen as the day in which these purchases would have been made. The closing price on the underlying contract was chosen rather than the open, high, or low price of the day. Contracts were chosen with expiration in December, March, June, and September to correspond with the quarters DOD uses in its fiscal year.

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While the budgeted and realized currency exchange rates are annotated on a monthly basis, many of the budgeted expenditures are recorded quarterly. For this reason, the monthly budgeted exchange rates were combined to provide a simple averaged quarterly exchange rate; likewise, the same procedure was used to create an average realized exchange rate. As an example, the actual exchange rates for October, November, and December, will be averaged together to provide the Q1 realized exchange rate.

One important note to mention is that the EURO is relatively new on the currency scene, compared to say the YEN, GBP or YUAN. As the EURO is comprised of the former currencies of many of its member countries, it is typically considered representative of Europe. However, not all Euro-member countries merged their currencies immediately upon the creation of the EURO. The German Duetschemark is still included in the DOD's 2001 and 2002 budget. Expenditures in the DM were approximately USD $900MM. This amount has not been included in the analysis, as the purpose is to analyze the results of hedging the EURO, not on hedging all European expenditures. As more member countries began to include their currency into the EURO, the US total EURO expenditures (irrespective of currency fluctuation) had increased because of an increase in the number of countries who use the EURO.

This is a passive/automated hedging strategy. It is as though the people who manage the Foreign Currency Fluctuation Account made no analysis concerning the relative valuation of the USD as compared to the EURO or YEN, or if it was in need of a hedge. These people would simple initiate a 100 percent hedge (either with futures or options) to fully cover all expected USD expenditures in these two currencies. No

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analysis has been undertaken to determine whether the derivatives themselves are over/under valued. It is an assumption that market arbitrage would eliminate or mitigate most, if not all of these inefficiencies. This automated and passive strategy is designed to eliminate any concerns that the account will be used for speculative purposes.

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Data Analysis

As this is an ex post facto experiment, the data will be analyzed to determine what would have been the results if the DOD had purchased futures contracts or options contracts on futures for the EURO and the YEN at the beginning of each fiscal year to hedge the difference between the budgeted exchange rate and the actual spot rate. It is assumed that all hedging contracts were "purchased" at the beginning of each fiscal year and no contracts were left open past the end of the same fiscal year.

The net difference in these hedged trades will be compared on a quarterly basis to the non-hedged results over this seven-year period. It is hoped that employing this method will reveal which of these strategies would have provided the greatest amount of budgetary certainty, with the least amount of loss due to currency fluctuation

To better analyze the effectiveness of hedging the DOD budget, testing will also be conducted to compare the results of hedging zero percent, 25 percent, 50 percent, 75 percent and 100 percent of the budgeted expenditures. These percentages have been chosen to determine whether or not it is in the best interest of the DOD to hedge none, some, or all of its risk to the foreign currency markets.

In addition, the DOD budget is not spent in equal quarterly installments; rather, it tends to be spent in more of an escalating manner throughout the fiscal year, according to

Mark Wagner from the Program and Budget Operations Directorate, Office of the Undersecretary of Defense, Comptroller. (M. Wagner, personal communications, December 14, 2007) Due to limitations in resources an approximation of these percentages was developed. The estimated percentage of the budgeted expenditures for these two currencies are 15 percent for Q1, 20 percent for Q2, 30 percent for Q3 and 35 percent for Q4. Based on conversations with those in the DOD finance community, these estimates are believed to be a fairly reasonable facsimile of the true percentage of quarterly expenditures. (M. Wagner, personal communications, December 14, 2007)

Some of the difficulties in ex post facto experiments are the ability of the research to show causality or to create a direct hypothesis. (Babbie 2004) These difficulties tend to be true of experiments involving people or multitudes of variables. The beauty of an ex post facto experiment involving numbers is that there are only as many variables as the experimenter wishes to introduce. This experiment has hopefully avoided these problems.

It is possible that if the DOD had actually purchased several hundred million dollars of contracts on a specified date(s), that would have affected the actual market value of the underlying contract. This will most likely be a threat to the forward contract market, due the lower amount of liquidity inherent in this market. However the other markets, especially the futures and options market, trade more than 200 billion contracts each year and the purchase of a few hundred contracts is not likely to have as great an impact. (CME 2006)

While this analysis attempts to hedge the DOD's projected exchange rate, establishing a perfect hedge was not be possible. In all instances, the derivative products

available did not have a strike price that matched the exact budgeted exchange rate. In such cases, the derivative with the closest match was used. We still view an imperfect hedge as better than the alternative of a non-hedged position.

Results and Analysis

After running the analysis two things quickly become obvious – this passive hedging strategy would have worked well for the EURO while not as well for the YEN. The results of using futures contracts are highlighted in Table 3. The DOD realized a non-hedged average annual loss of $665,782,780 from 2001 to 2007 on the EURO. While still realizing an overall loss compared to budgeted exchange rates, DOD could in fact have saved an average of $171MM on the EURO, had hedges using futures contracts been utilized. Given the fact that the DOD was still trading the DM in 2001 and 2002 instead of solely the EURO, the potential savings could have been higher. By eliminating the data from 2001 and 2002, the average annual savings for expenditures in the EURO would have been $208MM using options and $230MM using futures contracts.

Using futures to hedge the budgeted exchange rate for the YEN actually resulted in a greater loss. The average annual non-hedged loss from 2001 to 2007 on the YEN was $615,289. By using futures to hedge the expected budgeted exchange rates, this loss would have been increased by an additional $275,927.

While these results are comparing either no hedge or a 100 percent hedge, the results are proportionately similar when comparing the fractional hedging at 25, 50 and 75 percentages.

Table 1.

Annual Results of Hedging with Futures

Annual EURO Results Using Futures

Hedging %	0%	25%	50%	75%	100%
2001	-52,049,922	-51,910,755	-51,771,588	-51,632,420	-51,493,253
2002	-300,566,788	-289,581,625	-278,596,462	-267,611,300	-256,626,137
2003	-822,374,338	-730,748,663	-639,122,988	-547,497,313	-455,871,638
2004	-922,907,784	-871,120,680	-819,333,576	-767,546,473	-715,759,369
2005	1,154,843,013	1,135,012,695	1,115,182,378	1,095,352,060	1,075,521,743
2006	-523,419,928	-476,295,134	-429,170,339	-382,045,544	-334,920,750
2007	-884,317,690	-806,086,570	-727,855,451	-649,624,332	-571,393,212
Total Average	**-665,782,780**	**-622,965,160**	**-580,147,540**	**-537,329,920**	**-494,512,300**
Average Savings	**0**	**42,817,620**	**85,635,240**	**128,452,860**	**171,270,480**

Annual YEN Results Using Futures

Hedging %	0%	25%	50%	75%	100%
2001	-211,245	-584,068	-956,891	-1,329,713	-1,702,536
2002	-486,032	-585,787	-685,542	-785,298	-885,053
2003	-1,304,585	-1,241,718	-1,178,851	-1,115,983	-1,053,116
2004	-1,595,062	-1,573,551	-1,552,040	-1,530,528	-1,509,017
2005	-948,820	-936,016	-923,213	-910,410	-897,607
2006	56,557	-11,064	-78,686	-146,307	-213,928
2007	182,166	142,312	102,457	62,603	22,748
Total Average	**-615,289**	**-684,270**	**-753,252**	**-822,234**	**-891,216**
Average Savings	**0**	**-68,982**	**-137,964**	**-206,945**	**-275,927**

The results of hedging the DOD budget using options contract were similar to the results as with futures contracts – namely, savings would have been realized on the EURO and losses would have been compounded in the YEN. However, by using

options, the outside range of savings and losses are a bit more subdued, as can be seen in

Table 1. Whereas futures contracts were held until expiration, options contracts give the

holder the right to exercise the contract at the agreed upon rate or to simply let them

expire and trade the currency at the prevailing market rate. For this analysis, both

possibilities were considered and whichever proved to be the most advantageous to DOD

was chosen. If the contract was allowed to expire unexercised, the cost of the hedge was

added to the going spot rate as the total cost of the trade. In most cases, it was more

beneficial for DOD to exercise the option.

In the EURO, the resulting savings from fiscal year 2001 to 2007 using a 100

percent hedge would have been an average of $161MM per annum more than the non-

hedged strategy. This is approximately $10MM per annum less savings than would have

been realized using the futures contracts for the EURO. For the YEN during the same

time period, the loss using a 100 percent hedge would have been an average of $180,021

per year above the non-hedged strategy. This is almost a $100K savings when compared

to using futures contracts; but is a loss, nonetheless. Again, while these results compare

either no hedge or a 100 percent hedge, the results are proportionately similar when

comparing the fractional hedging at 25, 50 and 75 percentages.

Table 2

Annual Results of Hedging with Options

Annual EURO Results Using Options

Hedging %	0%	25%	50%	75%	100%
2001	-52,049,921	-53,925,659	-55,801,398	-57,677,136	-59,552,874
2002	-300,566,794	-277,993,843	-255,420,892	-232,847,940	-210,274,989
2003	-822,374,335	-748,076,979	-673,779,622	-599,482,266	-525,184,909
2004	-922,907,736	-884,999,485	-847,091,234	-809,182,982	-771,274,731
2005	1,154,843,020	1,148,225,822	1,141,608,625	-1,134,991,427	1,128,374,229
2006	-523,419,931	-431,374,577	-339,329,222	-247,283,868	-155,238,513
2007	-884,317,688	-834,849,174	-785,380,659	-735,912,145	-686,443,630
Total Average	**-665,782,775**	**-625,635,077**	**-585,487,379**	**-545,339,680**	**-505,191,982**
Average Savings	**0**	**40,147,698**	**80,295,396**	**120,443,095**	**160,590,793**

Annual YEN Results Using Options

Hedging %	0%	25%	50%	75%	100%
2001	-211,244	-349,473	-487,702	-625,930	-764,159
2002	-486,033	-605,835	-725,637	-845,438	-965,240
2003	-1,304,584	-1,300,601	-1,296,618	-1,292,634	-1,288,651
2004	-1,595,062	-1,597,007	-1,598,953	-1,600,898	-1,602,843
2005	-948,819	-948,464	-948,110	-947,755	-947,400
2006	56,557	16,244	-24,069	-64,381	-104,694
2007	182,167	163,081	143,995	124,909	105,823
Total Average	**-615,288**	**-660,294**	**-705,299**	**-750,304**	**-795,309**
Average Savings	**0**	**-45,005**	**-90,010**	**-135,016**	**-180,021**

Table 2 shows the results of options hedging for both the EURO and the YEN on an annual basis for fiscal years 2001 to 2007.

V. Discussion

In examining the results of this study, it is clearly obvious that given the budgeted exchange rate and currency fluctuations realized during fiscal years 2001 – 2007, the DOD would have realized a great deal of savings by choosing either hedging option (futures or options contracts) for the EURO. What is surprising is the increase of loss by using the same methodology when applied to the YEN. As many mutual fund perspectives say, past results are not a guarantee of future returns. This statement is just as true for this study. In the future, there could be some disruptive force, which could cause wild currency fluctuations in the EURO or provide a calming affect on the YEN.

A quick examination of Figure 2 shows the extreme fluctuations in the YEN, both up and down, and could be a partial explanation of why the particular hedging method used by this study did not have more favorable results. A simple hedge is more effective, as evidenced by the results on the EURO, when there is a general trend on the exchange rates. However, when rates fluctuate as severely as the YEN has, other strategies specifically designed for such environments can be more effective. In the world of options, such volatility is typically hedged with spreads, straddles, collars, etc.

While this study shows a greater savings using futures contracts on the EURO, for future implementation, options should also be considered. Because the option contract gives the option holder the right, but not the obligation to exercise the option, a greater level of protection is provided to the option holder against wild swings in the currency exchange rates, especially should some country decide to use a "financial nuclear option" against the USD.

One item that is important to note in this analysis is that when hedging using either futures or options, in no case was a 100 percent perfect hedge found that matched the budgeted exchange rate. As mentioned earlier, the closest strike price to the budgeted exchange rate was chosen; however there was not one instance in which a perfect match was found. It is unlikely that given the DOD's current method of estimating future exchange rates, that an exact exchange rate match will be found. This issue speaks more to the challenges of using a three-year weighted moving average of currency exchange rates than it does to the efficiency of the derivatives market. For example, in the FY 2007 budget, exchange rates from 2002, 2003, and 2004 were utilized when the planning for the FY 2007 budget began in 2005. While this method of estimating future exchange rates may work better on relatively stable currency pairs, it is less effective otherwise. Despite these shortcomings, the data clearly indicates that a passive hedging strategy on the EURO would have produced positive results.

The world currency markets trade trillions of USD annually, and much of this is done through the use of derivatives. Large multi-national corporations make use of these derivatives as a way to hedge negative exposure to certain currencies. If simply comparing total gross annual budgets, the US Department of Defense would likely be one of the largest global organizations; however it has yet to make use of derivatives to hedge its currency risks. As such, these risks are absorbed by the DOD rather than by the marketplace. These risks and losses are then passed along either to other areas of the defense budget or to the taxpayers directly.

The DOD places great importance on risk analysis and risk mitigation in the employment of its forces and material resources. Is it not reasonable that it should do the

same to its financial resources? By utilizing commercially available derivative products, the DOD can, as the results of this study conclude, take reasonable steps to protect its currency transactions from fluctuations and devaluation in the USD.

The method proposed by this study was a passive and automated hedging strategy on just two currency pairs, the USD/YEN and the USD/EURO. Further opportunities could exist in other currencies in which the DOD trades. However, the issues at hand with other currency pairs are a potential lack of market for derivative products and/or the possibility of the DOD actually moving the market when trading other currencies. It is for this reason the possibility of using derivative hedges on a "basket" of currencies might actually prove a more effective way to hedge against other currencies in which the DOD trades. Further research is required in this area.

Further study can also be done to compare the results of an actively managed hedging portfolio vs. a passive portfolio. Such a study could also examine various hedging strategies that extend beyond purchasing a futures contract or a call option. Shorts (puts), spreads, straddles, forwards, swaps or some other hybrid variation are other possibilities that should be examined in an effort to determine the optimum hedging strategy for the DOD. Another factor, which would provide for an interesting study, is the use of derivatives that extend past the end of the fiscal year. This study was limited in scope to a contract that could be entered at the beginning of the FY and concluded before the end of the FY. It would be interesting to see the results of a longer-term approach or an approach that allowed an actively (or even passively) managed account to transcend between fiscal years.

In examining these results, it seems clear the DOD is missing an opportunity to transfer its currency risks from the American taxpayer to the commercial markets, but there are solutions. One alternative might be to create an office within the DOD whose responsibilities were to make appropriate currency hedges for the DOD budget. The difficulty with this approach is that it takes time to develop these positions and acquire the skilled personnel needed. For this reason, hiring an outside firm to conduct hedging activities (within guidelines established by the DOD) could prove more efficient. This approach is similar to how the DOD develops weapon systems, namely from deals worked out in the commercial sector based on strict guidelines. The advantage to this second approach is that companies exist whose sole purpose is to provide such services for their clients. Hypothetically, even if such a firm charged a minimal fixed fee and retained 10 percent of the savings, the potential savings for the DOD could still be well worth the undertaking.

However, before undertaking any hedging strategy, some clarity regarding the permissibility of hedging needs to happen. As mentioned earlier, DOD7000.14-R states that forward contracts can be used, but a waiver from the Treasury Department must be obtained. This regulation also states that speculation in foreign currency is prohibited. Futures and options contracts are not forward contracts, but the principal behind using them could be construed by some as being the same. It is for this reason, the regulation should be re-written to specifically allow the use of derivatives for hedging purposes.

Once clarity has been achieved regarding currency hedging, the DOD needs to establish its criteria for such transactions. In other words, should a passive or active strategy be developed? It is this author's believe that a passive strategy would be a better

fit for the DOD as a way to "purchase insurance" against unfavorable currency moves and would eliminate the misconstrued perception that the DOD was engaging in speculation with the American taxpayer's money. For these reasons, it would appear that hedging using futures would provide the most satisfactory results; however it should also be mentioned that other strategies do exist and future study may indicate a better alternative.

Once clarification of DOD7000.14-R has been achieved, implementations of these hedging activities need to be established. Again, the two possible scenarios are the creations of governmental positions or to outsource these activities. The difficulty with creating a position(s) within the DOD is that such positions do not currently exist and their creation could take some time. The other issue is that by following a passive hedging strategy, in which trades are placed at the beginning of the fiscal year, there would not be full-time employment available. However, by outsourcing, the DOD would avoid these problems and could implement a hedging strategy much more quickly. The expertise is already in place in the private sector and the costs vs. the savings could make for such outsourcing very beneficial.

The goal of this paper was not to find the optimum hedging strategy, but rather to provide the seminal research for the concept and evidence that DOD could save money by employing a simple hedging strategy. It is this author's hope that this effort will provide the impetus for positive change within the DOD community and offer a way for the DOD to protect one of its key resources – its finances.

Appendix A

Quarterly Results of Futures Hedging the Euro and Yen 2001 - 2007

| **Total Spent 01** | | **EURO** | 671,088,000 | | |
| | | **YEN** | 1,229,490,000 | | |

	Q1 @ 15%	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Annual Total**
EURO	7,713,821	-13,585,922	-10,029,222	-20,720,957	**-52,049,922**
YEN	-147,932	-38,909	8,029	-32,432	**-211,245**

100% Hedged	**Q1 @ 15%**	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Annual Total**
EURO	7,080,750	-9,924,184	-15,570,785	-18,917,535	**-51,493,253**
YEN	-206,591	-310,618	-518,673	-666,654	**-1,702,536**

				Result if Hedged	
				EURO	**556,669**
				YEN	**-1,491,291**

| **Total Spent 02** | | **EURO** | 1,964,781,000 | | |
| | | **YEN** | 919,201,000 | | |

	Q1 @ 15%	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Annual Total**
EURO	33,869,946	-33,508,187	-94,538,051	-138,650,603	**-300,566,788**
YEN	-63,186	3,089	-155,915	-270,020	**-486,032**

100% Hedged	**Q1 @ 15%**	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Annual Total**
EURO	39,442,910	-51,726,043	-76,587,026	-88,870,159	**-256,626,137**
YEN	-119,363	-168,526	-266,853	-330,310	**-885,053**

				Result if Hedged	
				EURO	**43,940,650**
				YEN	**-399,021**

Total Spent 03

		EURO	2,749,981,000		
		YEN	1,264,306,000		

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	74,721,164	-153,446,281	-282,661,142	-311,545,751	**-822,374,338**
YEN	-122,031	-262,630	-378,369	-541,555	**-1,304,585**

100% Hedged	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	62,385,409	-94,458,217	-139,212,343	-159,815,668	**-455,871,638**
YEN	-111,278	-212,075	-329,870	-399,894	**-1,053,116**

				Result if Hedged	
				EURO	**366,502,700**
				YEN	**251,468**

Total Spent 04

		EURO	3,680,203,000		
		YEN	1,324,280,000		

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	130,018,002	-200,861,481	-267,844,217	-324,184,083	**-922,907,784**
YEN	-240,118	-380,333	-459,896	-514,715	**-1,595,062**

100% Hedged	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	109,933,607	-144,590,833	-214,126,098	-247,108,831	**-715,759,369**
YEN	-216,957	-295,897	-453,778	-542,385	**-1,509,017**

				Result if Hedged	
				EURO	**207,148,414**
				YEN	**86,045**

Total Spent 05　　　　　　**EURO**　　3,960,471,000
　　　　　　　　　　　　　　　YEN　　　729,762,000

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	209,348,180	-268,065,166	-324,236,988	-353,192,678	**1,154,843,013**
YEN	-183,342	-225,613	-281,783	-258,082	**-948,820**

100% Hedged	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	161,019,345	-214,771,669	-322,632,760	-377,097,969	**1,075,521,743**
YEN	-123,060	-171,523	-270,421	-332,604	**-897,607**

Result if Hedged

EURO	**79,321,270**
YEN	**51,212**

Total Spent 06　　　　　　**EURO**　　4,817,541,000
　　　　　　　　　　　　　　　YEN　　　692,213,000

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	36,172,001	-64,479,992	-188,704,141	-234,063,794	**-523,419,928**
YEN	22,625	21,514	-17,091	29,509	**56,557**

100% Hedged	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Annual Total
EURO	41,692,999	-61,179,013	-101,885,356	-130,163,382	**-334,920,750**
YEN	-14,048	-30,914	-67,138	-101,828	**-213,928**

Result if Hedged

EURO	**188,499,179**
YEN	**-270,486**

Total Spent 07		**EURO**	4,940,194,000		
		YEN	461,430,000		
	Q1 @ 15%	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Annual Total**
EURO	98,603,308	-146,450,207	-269,536,836	-369,727,338	**-884,317,690**
YEN	21,461	38,453	82,287	39,966	**182,166**
100% Hedged	**Q1 @ 15%**	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Annual Total**
EURO	79,191,631	-110,825,447	-172,907,432	-208,468,702	**-571,393,212**
YEN	16,342	12,099	4,305	-9,997	**22,748**

				Result if Hedged	
				EURO	**312,924,477**
				YEN	**-159,418**

Appendix B

Quarterly Results of Hedging the EURO with Options 2001 - 2007

Total Spent '01   **$671,088,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	-7,713,821	13,585,922	-10,029,222	-20,720,957	52,049,921
Exercise Opt.					
	-7,453,204	11,373,734	-17,422,988	-46,891,838	83,141,763

Results if Hedged   **31,091,842**

	Q1	Q2	Q3	Q4	Total
Don't Ex. Opt	-12,787,246	21,115,529	-25,712,548	-23,304,646	82,919,969
Best Result	-7,453,204	11,373,734	-17,422,988	-23,302,948	59,552,874

Best Results if Hedged   **-7,502,953**

Total Spent '02 $1,964,781,000
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	33,869,947	33,508,189	94,538,053	-138,650,606	300,566,794
Exercise Opt.					
	16,935,361	22,611,918	72,567,084	-98,160,626	210,274,989

Results if Hedged   **90,291,806**

	Q1	Q2	Q3	Q4	Total
Don't Ex. Opt	36,383,884	36,891,541	97,001,888	-141,270,641	311,547,955
Best Result	16,935,361	22,611,918	72,567,084	-98,160,626	210,274,989

Best Results if Hedged   **90,291,805**

Total Spent '03 $2,749,981,000
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	-74,721,165	153,446,283	282,661,139	-311,545,748	822,374,335
Exercise Opt.					
	-62,385,409	-95,118,213	160,414,697	-207,266,590	525,184,909
				Results if Hedged	**297,189,426**
Don't Ex. Opt	128,964,540	208,005,906	316,238,407	-341,960,537	995,169,391
Best Result	-62,385,409	-95,118,213	160,414,697	-207,266,590	525,184,909
				Best Results if Hedged	**297,189,426**

Total Spent '04 **3,680,203,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	-130,018,004	-200,861,439	267,844,214	324,184,079	-922,907,736
Exercise Opt.					
	-109,933,607	-144,590,833	224,945,894	291,804,897	-771,275,232
				Results if Hedged	**151,632,504**
Don't Ex. Opt	-234,186,150	-337,764,990	381,893,705	409,325,575	1,363,170,421
Best Result	-109,933,607	-144,590,333	224,945,894	291,804,897	-771,274,731
				Best Results if Hedged	**151,633,005**

Total Spent '05 $3,960,471,000
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	209,348,180	268,065,169	324,236,988	-353,192,683	1,154,843,020
Exercise Opt.	161,019,345	214,771,669	323,226,831	-429,356,384	1,128,374,228
				Results if Hedged	**26,468,792**
Don't Ex. Opt	316,637,340	403,275,649	516,240,622	-435,392,259	1,671,545,869
Best Result	161,019,345	214,771,669	323,226,831	-429,356,384	1,128,374,229
				Best Results if Hedged	**26,468,791**

Total Spent '06 **$4,817,541,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	-36,172,003	64,479,992	188,704,141	234,063,794	523,419,931
Exercise Opt.	1,108,444	-8,224,602	12,695,040	160,817,395	155,238,514
				Results if Hedged	**368,181,416**
Don't Ex. Opt	-41,064,216	71,070,388	202,463,038	240,268,787	554,866,429
Best Result	1,108,444	-8,224,602	12,695,040	160,817,395	155,238,513
				Best Results if Hedged	**368,181,418**

Total Spent '07 Non-hedged					
$4,940,194,000					
	Q1 @ 15%	**Q2 @ 20%**	**Q3 @ 30%**	**Q4 @ 35%**	**Total**
	-98,603,311	-146,450,203	-269,536,841	-369,727,333	-884,317,688
Exercise Opt.					
	-80,821,895	-129,400,576	-207,735,800	-268,467,359	-686,425,630
				Difference if Hedged	**197,892,058**
Don't Ex. Opt	-129,281,915	-174,411,702	-325,114,024	-434,740,286	1,063,547,926
Best Result	-80,821,895	-129,400,576	-207,753,800	-268,467,359	-686,443,630
				Best Results if Hedged	**197,874,058**

Appendix C

Quarterly Results of Hedging the YEN with Options FY 2001 - 2007

Total Spent '01 **$1,229,490,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	147,932	-38,908	8,030	-32,433	**-211,244**
Exercise Opt.					
	206,776	323,897	578,795	-919,683	2,029,150
				Results if Hedged	**1,817,907**
Don't Ex. Opt	297,130	187,677	197,418	-172,288	-854,513
Best Result	206,776	187,677	197,418	-172,288	-764,159
				Best Results if Hedged	**-552,915**

Total Spent '02 **$919,201,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	-63,186	3,089	155,915	270,020	**-486,033**
Exercise Opt.					
	124,327	170,181	274,850	405,915	-975,272
				Results if Hedged	**-489,240**
Don't Ex. Opt	118,063	166,412	402,169	417,368	1,104,011
Best Result	118,063	166,412	274,850	405,915	-965,240
		Best Results if Hedged	-479,207		

Total Spent '03 **$1,264,306,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	122,031	262,629	378,370	541,553	**1,304,584**
Exercise Opt.					
	113,175	216,120	373,109	760,094	1,462,499
				Results if Hedged	**-157,915**
Don't Ex. Opt	235,819	449,241	555,499	586,247	1,826,806
Best Result	113,175	216,120	373,109	586,247	1,288,651
				Best Results if Hedged	**15,933**

Total Spent '04 **$1,324,280,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	240,118	380,333	459,896	-514,715	**1,595,062**
Exercise Opt.					
	216,957	297,751	474,834	-613,301	1,602,842
				Results if Hedged	**-7,780**
Don't Ex. Opt	450,878	643,335	763,421	-789,105	2,646,739
Best Result	216,957	297,751	474,834	-613,301	1,602,843
				Best Results if Hedged	**-7,781**

Total Spent '05 $729,762,000
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	183,342	225,613	281,783	-258,081	**-948,819**
Exercise Opt.					
	123,607	173,421	316,177	-416,125	1,029,329
				Results if Hedged	**-80,511**
Don't Ex. Opt	248,801	336,099	350,308	-334,195	1,269,403
Best Result	123,607	173,421	316,177	-334,195	-947,400
				Best Results if Hedged	**1,419**

Total Spent –06 $692,213,000
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	22,625	21,514	-17,091	29,509	**56,557**
Exercise Opt.					
	20,901	43,236	-88,112	270,451	-422,700
				Results if Hedged	**-479,257**
Don't Ex. Opt	2,170	21,126	104,310	2,374	-120,892
Best Result	2,170	21,126	-88,112	2,374	-104,694
				Best Results if Hedged	**-161,251**

Total Spent '07 **$461,430,000**
Non-hedged

	Q1 @ 15%	Q2 @ 20%	Q3 @ 30%	Q4 @ 35%	Total
	21,461	38,453	82,286	39,967	**182,167**
Exercise Opt.					
	-616	-8,389	33,624	-51,664	-94,293
				Results if Hedged	**-276,460**
Don't Ex. Opt	19,039	27,655	58,892	237	105,823
Best Result	19,039	27,655	58,892	237	105,823
				Best Results if Hedged	**-76,344**

Appendix D

DOD EURO/YEN Currency Expenditures 2001 - 2007

EURO	2007	2006	2005	2004	2003	2002	2001
O&M	1,679,924,000	2,237,974,000	1,890,207,000	1,713,963,000	1,439,945,000	1,232,011,000	487,751,000
MilCon	1,289,306,000	956,015,000	834,741,000	831,653,000	702,006,000	338,423,000	70,729,000
Fam H. O&M	1,728,416,000	1,460,354,000	1,108,010,000	906,050,000	473,975,000	304,827,000	41,808,000
Fam H. Const.	242,548,000	163,198,000	127,513,000	228,537,000	134,055,000	89,520,000	70,800,000
Total	**4,940,194,000**	**4,817,541,000**	**3,960,471,000**	**3,680,203,000**	**2,749,981,000**	**1,964,781,000**	**671,088,000**
YEN	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**
O&M	147,179,000	387,871,000	409,569,000	442,347,000	566,316,000	361,310,000	281,424,000
MilCon	273,923,000	256,638,000	278,223,000	406,740,000	324,139,000	277,959,000	260,519,000
Fam H. O&M	37,615,000	41,656,000	39,871,000	438,046,000	351,657,000	263,553,000	672,063,000
Fam H. Const.	2,713,000	6,048,000	2,099,000	37,147,000	22,194,000	16,379,000	15,484,000
Total	**461,430,000**	**692,213,000**	**729,762,000**	**1,324,280,000**	**1,264,306,000**	**919,201,000**	**1,229,490,000**

Appendix E

DOD Budgeted and Actual Exchange Rates with Quarterly Averages 2001-2007

Budgeted FY 2001	Currency	USD to FC	FC to USD	Actual Expenditures Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	0.811359	1.2325	0.849329	1.1774
	Yen	0.0081878	122.1325	0.0091667	109.09
Nov	Euro	0.811359	1.2325	0.8722198	1.1465
	Yen	0.0081878	122.1325	0.009058	110.4
Dec	Euro	0.811359	1.2325	0.9424182	1.0611
	Yen	0.0081878	122.1325	0.0087451	114.35
Jan	Euro	0.811359	1.2325	0.9365927	1.0677
	Yen	0.0081878	122.1325	0.0085933	116.37
Feb	Euro	0.811359	1.2325	0.9231905	1.0832
	Yen	0.0081878	122.1325	0.0085215	117.35
Mar	Euro	0.811359	1.2325	0.8779631	1.139
	Yen	0.0081878	122.1325	0.0079233	126.21
April	Euro	0.811359	1.2325	0.8872327	1.1271
	Yen	0.0081878	122.1325	0.008088	123.64
May	Euro	0.811359	1.2325	0.8460237	1.182
	Yen	0.0081878	122.1325	0.0083921	119.16
June	Euro	0.811359	1.2325	0.8502678	1.1761
	Yen	0.0081878	122.1325	0.008018	124.72
July	Euro	0.811359	1.2325	0.8755801	1.1421
	Yen	0.0081878	122.1325	0.0079968	125.05
Aug	Euro	0.811359	1.2325	0.9116601	1.0969
	Yen	0.0081878	122.1325	0.0084203	118.76
Sep	Euro	0.811359	1.2325	0.9114939	1.0971
	Yen	0.0081878	122.1325	0.0083724	119.44

	Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	0.811359	EURO	Q1	0.887989	EURO	Q1	-0.07663000
	0.0081878	YEN		0.00898993	YEN		-0.00080213
Q2	0.811359	EURO	Q2	0.9125821	EURO	Q2	-0.10122310
	0.0081878	YEN		0.00834603	YEN		-0.00015823
Q3	0.811359	EURO	Q3	0.86117473	EURO	Q3	-0.04981573
	0.0081878	YEN		0.00816603	YEN		0.00002177
Q4	0.811359	EURO	Q4	0.89957803	EURO	Q4	-0.08821903
	0.0081878	YEN		0.00826317	YEN		-0.00007537

FY 2002

	Currency	USD to FC	FC to USD	Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	0.7810669	1.2803	0.899928	1.1112
	Yen	0.0074963	133.4	0.0081679	122.43
Nov	Euro	0.7810669	1.2803	0.8965394	1.1154
	Yen	0.0074963	133.4	0.0081011	123.44
Dec	Euro	0.7810669	1.2803	0.891504	1.1217
	Yen	0.0074963	133.4	0.0075947	131.67
Jan	Euro	0.7810669	1.2803	0.8583691	1.165
	Yen	0.0074963	133.4	0.007425	134.68
Feb	Euro	0.7810669	1.2803	0.8690362	1.1507
	Yen	0.0074963	133.4	0.0074817	133.66
Mar	Euro	0.7810669	1.2803	0.8716116	1.1473
	Yen	0.0074963	133.4	0.0075318	132.77
April	Euro	0.7810669	1.2803	0.9004142	1.1106
	Yen	0.0074963	133.4	0.0077767	128.59
May	Euro	0.7810669	1.2803	0.9325748	1.0723
	Yen	0.0074963	133.4	0.0080451	124.3
June	Euro	0.7810669	1.2803	0.991375	1.0087
	Yen	0.0074963	133.4	0.0083633	119.57
July	Euro	0.7810669	1.2803	0.9775171	1.023
	Yen	0.0074963	133.4	0.0083459	119.82
Aug	Euro	0.7810669	1.2803	0.9828976	1.0174
	Yen	0.0074963	133.4	0.0084467	118.39
Sep	Euro	0.7810669	1.2803	0.9876543	1.0125
	Yen	0.0074963	133.4	0.0082142	121.74

	Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	0.7810669	EURO	Q1	0.89599047	EURO	Q1	-0.11492357
	0.0074963	YEN		0.00795457	YEN		-0.00045827
Q2	0.7810669	EURO	Q2	0.86633897	EURO	Q2	-0.08527207
	0.0074963	YEN		0.0074795	YEN		0.00001680
Q3	0.7810669	EURO	Q3	0.94145467	EURO	Q3	-0.16038777
	0.0074963	YEN		0.0080617	YEN		-0.00056540
Q4	0.7810669	EURO	Q4	0.98268967	EURO	Q4	-0.20162277
	0.0074963	YEN		0.0083356	YEN		-0.00083930

FY 2003	Currency	USD to FC	FC to USD	Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	0.8782716	1.1386	0.989805	1.0103
	Yen	0.0080431	124.33	0.0081599	122.55
Nov	Euro	0.8062566	1.2403	0.9944312	1.0056
	Yen	0.0073833	135.4401	0.0081599	122.55
Dec	Euro	0.8062566	1.2403	1.049979	0.9524
	Yen	0.0073833	135.4401	0.0084203	118.76
Jan	Euro	0.8062566	1.2403	1.0765421	0.9289
	Yen	0.0073833	135.4401	0.008341	119.89
Feb	Euro	0.8062566	1.2403	1.0800302	0.9259
	Yen	0.0073833	135.4401	0.008466	118.12
Mar	Euro	0.8062566	1.2403	1.099183	0.9175
	Yen	0.0073833	135.4401	0.0084588	118.22
April	Euro	0.8062566	1.2403	1.118068	0.8944
	Yen	0.0073833	135.4401	0.0084111	118.89
May	Euro	0.8062566	1.2403	1.1770245	0.8496
	Yen	0.0073833	135.4401	0.0083787	119.35
June	Euro	0.8062566	1.2403	1.1515431	0.8684
	Yen	0.0073833	135.4401	0.0083528	119.72
July	Euro	0.8062566	1.2403	1.1243535	0.8894
	Yen	0.0073833	135.4401	0.0082932	120.58
Aug	Euro	0.8062566	1.2403	1.0990219	0.9099
	Yen	0.0073833	135.4401	0.0085572	116.86
Sep	Euro	0.8062566	1.2403	1.1664528	0.8573
	Yen	0.0073833	135.4401	0.008971	111.47

	Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	0.8302616	EURO	Q1	1.01140507	EURO	Q1	-0.18114347
	0.00760323	YEN		0.0082467	YEN		-0.00064347
Q2	0.8062566	EURO	Q2	1.08525177	EURO	Q2	-0.27899517
	0.0073833	YEN		0.00842193	YEN		-0.00103863
Q3	0.8062566	EURO	Q3	1.14887853	EURO	Q3	-0.34262193
	0.0073833	YEN		0.00838087	YEN		-0.00099757
Q4	0.8062566	EURO	Q4	1.12994273	EURO	Q4	-0.32368613
	0.0073833	YEN		0.00860713	YEN		-0.00122383

FY 2004	Currency	USD to FC	FC to USD	Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	0.9695559	1.0314	1.1583459	0.8633
	Yen	0.0079688	125.49	0.0090959	109.94
Nov	Euro	0.9695559	1.0314	1.1990408	0.834
	Yen	0.0079688	125.49	0.0091233	109.61
Dec	Euro	0.9695559	1.0314	1.2578616	0.795
	Yen	0.0079688	125.49	0.0093136	107.37
Jan	Euro	0.9695559	1.0314	1.247505	0.8016
	Yen	0.0079688	125.49	0.0094554	105.76
Feb	Euro	0.9695559	1.0314	1.2495314	0.8003
	Yen	0.0079688	125.49	0.0091768	108.97
Mar	Euro	0.9695559	1.0314	1.230315	0.8128
	Yen	0.0079688	125.49	0.0095822	104.36
April	Euro	0.9695559	1.0314	1.1980352	0.8347
	Yen	0.0079688	125.49	0.009049	110.51
May	Euro	0.9695559	1.0314	1.218769	0.8205
	Yen	0.0079688	125.49	0.0091416	109.39
June	Euro	0.9695559	1.0314	1.2196609	0.8199
	Yen	0.0079688	125.49	0.0091886	108.83
July	Euro	0.9695559	1.0314	1.2023566	0.8317
	Yen	0.0079688	125.49	0.0089928	111.2
Aug	Euro	0.9695559	1.0314	1.2177302	0.8212
	Yen	0.0079688	125.49	0.009155	109.23
Sep	Euro	0.9695559	1.0314	1.2436264	0.8041
	Yen	0.0079688	125.49	0.0090901	110.01

Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	0.9695559	EURO	Q1	1.20508277	EURO	Q1	-0.23552687
	0.0079688	YEN		0.0091776	YEN		-0.00120880
Q2	0.9695559	EURO	Q2	1.24245047	EURO	Q2	-0.27289457
	0.0079688	YEN		0.0094048	YEN		-0.00143600
Q3	0.9695559	EURO	Q3	1.21215503	EURO	Q3	-0.24259913
	0.0079688	YEN		0.0091264	YEN		-0.00115760
Q4	0.9695559	EURO	Q4	1.22123773	EURO	Q4	-0.25168183
	0.0079688	YEN		0.0090793	YEN		-0.00111050

FY 2005	Currency	USD to FC	FC to USD	Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	0.9695559	1.0314	1.2797543	0.7814
	Yen	0.0079688	125.49	0.0094482	105.84
Nov	Euro	0.9695559	1.0314	1.3294337	0.7522
	Yen	0.0079688	125.49	0.0097182	102.9
Dec	Euro	0.9695559	1.0314	1.356668	0.7371
	Yen	0.0079688	125.49	0.0097647	102.41
Jan	Euro	0.9695559	1.0314	1.3034411	0.7672
	Yen	0.0079688	125.49	0.0096497	103.63
Feb	Euro	0.9695559	1.0314	1.3243279	0.7551
	Yen	0.0079688	125.49	0.0095657	104.54
Mar	Euro	0.9695559	1.0314	1.2961763	0.7715
	Yen	0.0079688	125.49	0.0093284	107.2
April	Euro	0.9695559	1.0314	1.2866701	0.7772
	Yen	0.0079688	125.49	0.0095374	104.85
May	Euro	0.9695559	1.0314	1.2304663	0.8127
	Yen	0.0079688	125.49	0.009214	108.53
June	Euro	0.9695559	1.0314	1.2102142	0.8263
	Yen	0.0079688	125.49	0.0090163	110.91
July	Euro	0.9695559	1.0314	1.2124151	0.8248
	Yen	0.0079688	125.49	0.0088952	112.42
Aug	Euro	0.9695559	1.0314	1.2336541	0.8106
	Yen	0.0079688	125.49	0.0090351	110.68
Sep	Euro	0.9695559	1.0314	1.2269939	0.815
	Yen	0.0079688	125.49	0.0090074	111.02

	Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	0.9695559	EURO	Q1	1.321952	EURO	Q1	-0.35239610
	0.0079688	YEN		0.0096437	YEN		-0.00167490
Q2	0.9695559	EURO	Q2	1.30798177	EURO	Q2	-0.33842587
	0.0079688	YEN		0.0095146	YEN		-0.00154580
Q3	0.9695559	EURO	Q3	1.2424502	EURO	Q3	-0.27289430
	0.0079688	YEN		0.0092559	YEN		-0.00128710
Q4	0.9695559	EURO	Q4	1.22435437	EURO	Q4	-0.25479847
	0.0079688	YEN		0.00897923	YEN		-0.00101043

FY 2006	Currency	USD to FC	FC to USD	Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	1.1383039	0.8785	1.198466	0.8344
	Yen	0.0086957	115	0.0085911	116.4
Nov	Euro	1.1383039	0.8785	1.1791062	0.8481
	Yen	0.0086957	115	0.0083459	119.82
Dec	Euro	1.1383039	0.8785	1.1875074	0.8421
	Yen	0.0086957	115	0.0084964	117.6967
Jan	Euro	1.1383039	0.8785	1.2118274	0.8252
	Yen	0.0086957	115	0.0084955	117.71
Feb	Euro	1.1383039	0.8785	1.1924636	0.8386
	Yen	0.0086957	115	0.0086341	115.82
Mar	Euro	1.1383039	0.8785	1.211387	0.8255
	Yen	0.0086957	115	0.0084913	117.768
April	Euro	1.1383039	0.8785	1.2537613	0.7976
	Yen	0.0086957	115	0.0087489	114.2999
May	Euro	1.1383039	0.8785	1.2815584	0.7803
	Yen	0.0086957	115	0.0088857	112.54
June	Euro	1.1383039	0.8785	1.2712942	0.7866
	Yen	0.0086957	115	0.0086994	114.9503
July	Euro	1.1383039	0.8785	1.2774655	0.7828
	Yen	0.0086957	115	0.0087222	114.65
Aug	Euro	1.1383039	0.8785	1.2851819	0.7781
	Yen	0.0086957	115	0.0085237	117.3205
Sep	Euro	1.1383039	0.8785	1.2687135	0.7882
	Yen	0.0086957	115	0.0084758	117.983

	Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	1.1383039	EURO	Q1	1.18835987	EURO	Q1	-0.05005597
	0.0086957	YEN		0.0084778	YEN		0.00021790
Q2	1.1383039	EURO	Q2	1.205226	EURO	Q2	-0.06692210
	0.0086957	YEN		0.0085403	YEN		0.00015540
Q3	1.1383039	EURO	Q3	1.2688713	EURO	Q3	-0.13056740
	0.0086957	YEN		0.008778	YEN		-0.00008230
Q4	1.1383039	EURO	Q4	1.2771203	EURO	Q4	-0.13881640
	0.0086957	YEN		0.0085739	YEN		0.00012180

FY 2007	Currency	USD to FC	FC to USD	Adjusting Rate in USD	Adjusting Rate in FC
Oct	Euro	1.1723329	0.853	1.2764871	0.7834
	Yen	0.0088261	113.3	0.0085551	116.8899
Nov	Euro	1.1723329	0.853	1.3199996	0.7576
	Yen	0.0088261	113.3	0.0085911	116.4002
Dec	Euro	1.1723329	0.853	1.3197	0.7577
	Yen	0.0088261	113.3	0.0084019	119.02
Jan	Euro	1.1723329	0.853	1.3034411	0.7672
	Yen	0.0088261	113.3	0.0082871	120.67
Feb	Euro	1.1723329	0.853	1.3227569	0.756
	Yen	0.0088261	113.3	0.0084515	118.3224
Mar	Euro	1.1723329	0.853	1.3354701	0.7488
	Yen	0.0088261	113.3	0.0084897	117.79
April	Euro	1.1723329	0.853	1.3635124	0.7334
	Yen	0.0088261	113.3	0.0083612	119.5998
May	Euro	1.1723329	0.853	1.3449899	0.7435
	Yen	0.0088261	113.3	0.0082149	121.7307
June	Euro	1.1723329	0.853	1.3540961	0.7385
	Yen	0.0088261	113.3	0.0081189	123.17
July	Euro	1.1723329	0.853	1.3708019	0.7295
	Yen	0.0088261	113.3	0.0083925	119.1535
Aug	Euro	1.1723329	0.853	1.3642006	0.733
	Yen	0.0088261	113.3	0.0086326	115.8402
Sep	Euro	1.1723329	0.853	1.4234875	0.07025
	Yen	0.0088261	113.3	0.0087108	114.8

	Quarterly Averages Budgeted Rate			Realized Quarterly Average Rate			Difference
Q1	1.1723329	EURO	Q1	1.30539557	EURO	Q1	-0.13306267
	0.0088261	YEN		0.00851603	YEN		0.00031007
Q2	1.1723329	EURO	Q2	1.32055603	EURO	Q2	-0.14822313
	0.0088261	YEN		0.00840943	YEN		0.00041667
Q3	1.1723329	EURO	Q3	1.35419947	EURO	Q3	-0.18186657
	0.0088261	YEN		0.00823167	YEN		0.00059443
Q4	1.1723329	EURO	Q4	1.38616333	EURO	Q4	-0.21383043
	0.0088261	YEN		0.00857863	YEN		0.00024747

Appendix F

EURO Futures Data 2001-2007

EURO

Trade Date	Delivery Month	Contract Year	Settle Price
100200	12	2000	0.8817
100200	3	2001	0.8853
100200	6	2001	0.8887
100200	9	2001	0.8919

Trade Date	Delivery Month	Contract Year	Settle Price
100101	12	2001	0.9149
100101	3	2002	0.9127
100101	6	2002	0.911
100101	9	2002	0.9103

Trade Date	Delivery Month	Contract Year	Settle Price
100102	12	2002	0.9815
100102	3	2003	0.978
100102	6	2003	0.975
100102	9	2003	0.9723

Trade Date	Delivery Month	Contract Year	Settle Price
100103	12	2003	1.1687
100103	3	2004	1.166
100103	6	2004	1.1635
100103	9	2004	1.1614

Trade Date	Delivery Month	Contract Year	Settle Price
100104	12	2004	1.2406
100104	3	2005	1.2407
100104	6	2005	1.2411
100104	9	2005	1.2416

Trade Date	Delivery Month	Contract Year	Settle Price
100305	12	2005	1.196
100305	3	2006	1.2018
100305	6	2006	1.2088
100305	9	2006	1.2155

Trade Date	Delivery Month	Contract Year	Settle Cabinet	Settle Price
100206	12	2006		1.2792
100206	3	2007		1.2845
100206	6	2007		1.289
100206	9	2007		1.2929

Appendix G

YEN Futures Data 2001-2007

YEN

Trade Date	Delivery Month	Contract Year	Settle Price
100200	12	2000	0.009308
100200	3	2001	0.009451
100200	6	2001	0.009594
100200	9	2001	0.009737

Trade Date	Delivery Month	Contract Year	Settle Price
100101	12	2001	0.008362
100101	3	2002	0.008413
100101	6	2002	0.008464
100101	9	2002	0.008523

Trade Date	Delivery Month	Contract Year	Settle Price
100102	12	2002	0.00819
100102	3	2003	0.008222
100102	6	2003	0.008253
100102	9	2003	0.008287

Trade Date	Delivery Month	Contract Year	Settle Price
100103	12	2003	0.009061
100103	3	2004	0.009086
100103	6	2004	0.009111
100103	9	2004	0.009139

Trade Date	Delivery Month	Contract Year	Settle Price
100104	12	2004	0.009093
100104	3	2005	0.009144
100104	6	2005	0.009204
100104	9	2005	0.009271

Trade Date	Delivery Month	Contract Year	Settle Price
100305	12	2005	0.008831
100305	3	2006	0.008919
100305	6	2006	0.009019
100305	9	2006	0.009116

Trade Date	Delivery Month	Contract Year	Settle Price
100206	12	2006	0.00859
100206	3	2007	0.008695
100206	6	2007	0.008795
100206	9	2007	0.008888

Appendix H

EURO Options Data 2001 - 2007

EURO

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100200	12	2000	0.835	0.0504
100200	3	2001	0.84	0.0561
100200	6	2001	0.82	0.0779
100200	9	2001	1	0.011

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100101	12	2001	0.83	0.00853
100101	3	2002	0.83	0.00861
100101	6	2002	0.9	0.00418
100101	9	2002	0.92	0.00381

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100102	12	2002	0.85	0.1315
100102	3	2003	0.88	0.0992
100102	6	2003	0.96	0.0407
100102	9	2003	0.99	0.0316

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100103	12	2003	0.98	0.1887
100103	3	2004	0.98	0.186
100103	6	2004	1.07	0.1033
100103	9	2004	1.13	0.0661

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100104	12	2004	1.06	0.1806
100104	3	2005	1.07	0.1707
100104	6	2005	1.08	0.1616
100104	9	2005	1.22	0.0593

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100305	12	2005	1.13	0.00677
100305	3	2006	1.14	0.00684
100305	6	2006	1.12	0.00952
100305	9	2006	1.23	0.00368

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100206	12	2006	1.24	0.0414
100206	3	2007	1.275	0.0283
100206	6	2007	1.275	0.0375
100206	9	2007	1.29	0.0376

Appendix I

YEN Options Data 2001 - 2007

YEN

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100200	12	2000	0.0085	0.000809
100200	3	2001	0.0089	0.000605
100200	6	2001	0.0092	0.000557
100200	9	2001	0.01	0.000325

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100101	12	2001	0.008	0.000398
100101	3	2002	0.0075	0.000922
100101	6	2002	0.0076	0.000893
100101	9	2002	0.0083	0.000458

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100102	12	2002	0.0076	0.0006
100102	3	2003	0.0075	0.000738
100102	6	2003	0.0079	0.000467
100102	9	2003	0.009	0.000101

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100103	12	2003	0.008	0.001061
100103	3	2004	0.0081	0.000993
100103	6	2004	0.0084	0.000764
100103	9	2004	0.0087	0.000592

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100104	12	2004	0.0085	0.000598
100104	3	2005	0.0084	0.000757
100104	6	2005	0.0091	0.000313
100104	9	2005	0.0093	0.000298

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100104	12	2004	0.0085	0.000598
100104	3	2005	0.0084	0.000757
100104	6	2005	0.0091	0.000313
100104	9	2005	0.0093	0.000298

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100305	12	2005	0.0087	0.000197
100305	3	2006	0.0087	0.000308
100305	6	2006	0.0087	0.00042
100305	9	2006	0.0097	0.000112

Trade Date	Delivery Month	Contract Year	Strike Price	Settle Price
100206	12	2006	0.0088	0.000035
100206	3	2007	0.0088	0.000117
100206	6	2007	0.0089	0.000169
100206	9	2007	0.0089	0.000246

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