



analysis-research-planning

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Memorandum

To: Francis McGovern, Special Master
From: B. Thomas Florence
Date: July 15, 2008
Re: Algorithm Status Report

Currency Conversion Fee Settlement

The Settlement is about the prices that cardholders of Visa and MasterCard credit and debit/ATM cards, and Diners Club credit cards (including charge cards) were charged to make transactions denominated in a foreign currency or with a foreign merchant. Claimants can ask for a refund of fees charged to their eligible cards for foreign transactions from February 1, 1996 to November 8, 2006.

Individual claimants can use one of three claim forms to ask for a refund:

- Refund Option 1: Request an *Easy Refund* of \$25.
- Refund Option 2: Request a *Total Estimation Refund* based on typical spending during travel and your answers to a few questions about your own travel outside of the U.S.
- Refund Option 3: Request a refund based on information that you provide concerning your *Annual Estimated* foreign transactions during the 1996 to 2006 period.

ARPC is tasked with developing the algorithm that will determine refunds to Option 2 claimants. This report reviews the purpose of the Option 2 alternative, including the “best” information to achieve the Option 2 purpose and the alternatives available; algorithm development; outcomes; and additional considerations concerning atypical claims.

Purpose of Option 2

The original notice to class members required information concerning relevant transactions dating back to 1996. Although this information would allow precision in refund estimation, the interim response rate to the original notice suggested that reporting requirements might be too burdensome for the majority of class members.

In a July 10, 2007 memorandum to Judge Pauley, Special Master Francis McGovern discussed possible approaches to meet the goal of maximizing participation and insuring a fair and reasonable distribution process.

The original approach, which was slightly modified and presented as Option 3, is appropriate for claimants with high transaction amounts, but requires a level of effort by claimants that is unlikely to be commensurate with the level of recovery for claimants with smaller transaction amounts.

The “Easy Refund” approach was developed and presented as Option 1, and provides a viable alternative for low-value claims, but disadvantages claimants with substantial foreign expenditures.

Claimants with more than minimal but less than substantial foreign expenditures would be disadvantaged by either of the above approaches. In theory, the burden of providing information might be shifted from the claimant to the defendant banks. However, much of the necessary bank information is not maintained in a readily analyzable format.¹ In any event, the information would be incomplete because it would exclude non-defendant-bank data.

An alternative to shifting the burden for complete transaction reporting is to require less detailed information from claimants but require them to provide general information about their travel experiences and foreign expenditures. A possible solution would be to provide expenditure categories (for example, \$0 to \$1,000; \$10,001 to \$25,000) and request the claimant to provide an estimate of foreign transaction amounts. However, in addition to the difficulties of determining appropriate categories that would minimize unintentional error and intentional fraud, field testing of this approach in August 2007 suggested that claimants find it very difficult to accurately estimate their expenditures over the class period.

Although, during field testing, all interviewees had significant difficulties in estimating expenditures, they were more amenable to a request for estimating number of days of travel outside of the U.S. Interviewees tended to recall trips, and using that recall, estimate the number of days spent traveling over the class period. In addition, interviewees found it easy to report on the purpose of their travel, using a scale from Never to Mostly for each of the provided purposes: Visiting Friends or Relatives (VFR), Vacation or Leisure, Traveling on Business, or Other Purpose.

Once it was established that claimants would be willing and able to answer questions concerning the nature and length of their travel outside of the U.S., the claimants could be compared with U.S. residents who traveled outside of the U.S. between 1996 and 2006 for similar purposes and whose experience was captured in government-sponsored

¹ Participating banks provided sample foreign transaction data for the purpose of validating calculations provided herein.

surveys that are representative of the population of U. S. resident international travelers.² In addition to reporting on their purpose of travel and the length of their trips, U. S. resident survey responders reported on their spending amounts and patterns for transactions occurring outside of the U.S. These spending patterns provided financial information that could be applied to the estimations of Option 2 claims.

A Cover Letter mailed to cardholders describes Refund Option 2:

Request a **Total Estimation Refund** based on typical spending during travel and your answers to a few questions about your own travel outside of the U.S. This Option is recommended if you traveled outside of the U.S. for more than one week or had foreign transactions of more than \$2,500 using your eligible cards during the 1996 to 2006 period. Refunds will be a maximum of 1% of estimated foreign transactions.

In addition, the Option 2 Form advises that:

The **Total Estimation Refund** is based on a 1% refund for estimates of typical foreign transaction activity using Visa, MasterCard and/or Diners Club credit, charge, or debit/ATM cards. The Settlement Administrator will estimate a fee refund using your responses to a few simple questions and available information that can be accessed by computer.

If you spent more than one week outside the United States or had more than \$2,500 in foreign transactions from February 1, 1996 to November 8, 2006, you may prefer this Option to the Easy Refund. If you had extensive foreign travel or foreign transactions, you may prefer to provide more detailed annual estimates by using the Annual Estimation Refund Option, which may allow for refunds of up to 3% of foreign transactions.

Option 2 algorithm estimates are based on “**typical foreign transaction activity**”. **Typical** is defined as characteristic of the majority of the population. Some Option 2 travel or spending is atypical. In developing the algorithm, the statistical median has been used in estimating typical patterns. Medians represent the point where 50% of values are lower and 50% are higher. Averages can be greatly influenced by extremely high values, in which case they do not represent patterns of spending or travel that are typical of most people.

It is expected that some refunds will over-compensate and some refunds will under-compensate Option 2 filers, based on claimants’ own personal travel patterns and how

² Surveys from the governments of the U.S., Canada, and Mexico were included. The survey names and/or web locations are: United States Department of Commerce, United States International Trade Administration, Survey of International Air Travelers; Statistics Canada, The International Travel Survey (ITS); Air Exit Survey of Overseas Travellers; Statistics Canada, The International Travel Survey (ITS); Frontier Counts survey; Secretaria de Turismo (SECTUR) at <http://datatur.sectur.gob.mx>.

those differ from typical patterns. The goal of the algorithm is to estimate *typical* daily foreign currency spending.

Option 2 Algorithm Development

An algorithm is: “A finite set of unambiguous instructions performed in a prescribed sequence to achieve a goal, especially a mathematical rule of procedure used to compute a desired result. Algorithms are the basis for most computer programming.”³ For example, an algorithm for calculating your total grocery bill would instruct you to add up the amounts of the individual items you purchased.⁴

The goal of the Option 2 Algorithm is to establish a set of procedures whereby:

1. The number of total days of travel reported by each Option 2 claimant is divided among the purposes of travel. This is required because typical spending differs substantially for different travel purposes. For example, if a claimant reports 30 days of travel, which were “Never” for the purpose of Visiting Friends/Relatives, for Vacation/Leisure, or Other Purpose, and “Mostly” for Business purposes, then all 30 days would be allocated to Business travel.
2. An estimate of typical daily foreign spending is established for each of the travel purposes. Estimates are limited to transactions using credit/charge/debit cards specified in the Settlement Agreement. The estimates are derived using surveys conducted for governmental departments in the U.S., Canada, and Mexico.⁵
3. For each claimant, the number of days spent traveling for each of the four travel purposes is multiplied by the daily spending estimate for the appropriate travel purpose. The four resultant amounts are then summed to derive an estimated total foreign transaction amount.
4. For each claimant, the total eligible foreign transaction amount is multiplied by 1%. If the result is less than the Option 1 amount, then the result is set to the Option 1 amount.
5. The result from the above procedures is a base Option 2 Refund Amount, without adjustment for atypical travel patterns. Possible adjustments for atypical travel will be discussed in a later section of this report.

The set of Algorithm procedures is described in more detail below:

³ The American Heritage Science Dictionary. Copyright 2002 by Houghton Mifflin Company.

⁴ Example from The American Heritage New Dictionary of Cultural Literacy, Third Edition. Copyright 2005 by Houghton Mifflin Company.

⁵ See note 2 *supra*.

Algorithm Step 1: Allocate claimant days to purpose-of-travel categories

Step 1 allocates claimant days to purpose-of-travel categories. Respondents were asked how often they traveled for four travel purposes. Travel surveys show that the number of days and amounts spent vary by travel purpose. For example, travelers who are Visiting Friends or Relatives tend to spend more days out of the country but to spend less per day. The travel purposes and frequency categories are:

	Never	Rarely	Sometimes	Often	Mostly
Traveling on business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visiting friends or relatives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vacation or leisure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other purpose for travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The analysis assigns a weight to each frequency from Never = 0 to Mostly = 4. The weights are totaled across the four purpose categories. The weight for each of the purposes is divided by the total weights to produce a percentage of days to be assigned to each category of purpose. The percentages are then multiplied by the total reported days.

The table below gives a hypothetical calculation of allocation of travel purpose for a respondent. If a respondent with 80 days of travel answered that they rarely traveled for Business, Sometimes traveled to Visit Friends/Relatives, Often traveled on Vacation/Leisure, and mostly traveled for other purposes, the 80 travel days would be assigned as in the example below:

Purpose	Frequency	Frequency Weight	Proportion of Total	Allocated Days
Business	Rarely	1	10%	8
Visiting Friends/Relatives	Sometimes	2	20%	16
Vacation/Leisure	Often	3	30%	24
Other	Mostly	4	40%	32
Total		10	100%	80

Algorithm Step 2: Estimate typical daily foreign spending for each of the travel purposes

Step 2 is the most complex part of the algorithm. It establishes daily eligible spending for each of the travel purposes. Analysis of travel and tourism data for algorithm purposes provides an estimate of the per-day non-domestic spending of U.S. travelers for each of the four categories of travel purpose. Official government travel and tourism sources provide estimates of almost all U.S. resident international travel including border travel to Mexico and Canada and air travel to all non-U.S. destinations.

Air travel statistics tend to provide the most detailed information, whereas same-day travel statistics are more basic. Most statistics for overnight travel provide separate estimates for travel with the main purposes of Business, Visiting Friends and/or Relatives (“VFR”), Vacation/Leisure, and Other, which each have distinctive typical patterns. For

example, VFR travelers, on average, report a higher number of travel days and lower per-day spending, whereas Business travelers report more frequent and shorter trips with higher per-day spending.

As might be expected, travelers who stay at least one night generally spend more per day than same-day travelers. Travelers overseas typically have higher daily averages than travelers to Canada or Mexico. The Option 2 algorithm explicitly considers these distinctive travel and spending patterns, adjusted for expenditures using other means (e.g. Travelers Checks, cash, or “other” credit cards not covered by the Settlement Agreement).

The official sources of survey data are:

*U.S. Department of Commerce, Office of Travel and Tourism Industries
Survey of International Air Travelers*

The annual Survey of International Air Travelers is conducted through approximately 50 international airlines for all destinations except Canada. Department of Homeland Security data are used to expand the survey to represent all U.S. travelers. Available results include all years from 1996 to 2006.

The counts of trips represent person-trips over the year, not individuals. For example, in 2006, 30.1 million airline trips (except to Canada) were taken by U.S. resident travelers visiting overseas destinations. Some of these trips represent more than one journey for an individual.

Respondents report the number of nights that they spend outside the USA on their trip. They also estimate the amount of money they spend on the trip outside of the USA, not including any money that was paid for a booked travel package.

The per-trip amount spent outside of the USA, divided by the number of nights spent outside of the USA, gives an estimate of the per-day spending.

Respondents are asked about how they pay for their trip expenses: credit cards, traveler’s checks, debit cards, or cash. However, the survey question does not differentiate between out-of-USA spending and other expenses, such as airline tickets, which would be made in U.S. dollars.

Respondents are asked about the main purpose of their trip. Publicly-available data combine Visiting Friends or Relatives (VFR) with Leisure/Vacation. Because travel and spending patterns differ between these categories, additional tables for 1996, 2000, and 2006 were purchased from CIC Research, the contractor for the survey. These tables were used to provide additional detail on the proportion of travelers in each of the four purpose categories. The CIC tables, which include air travel to Mexico, and limit the analysis to claimants who reported any credit or debit card expenditures, provide the

basis for the non-Canadian air traveler estimates. In addition to average spending per visitor-day, the median spending was calculated and provided by CIC Research.

Statistics Canada

Statistics Canada provides statistics related to Canadian studies of overnight and same-day travel to Canada by U.S. residents. The survey of overnight travelers contains information similar to the U.S. survey, including estimates of number of nights and spending for each of the four purpose-of-travel categories. For same-day travel statistics, the proportion of travelers in the purpose-of-travel categories is estimated from the survey of overnight travelers. Average daily spending is estimated by approximating proportions derived from the Canadian overnight statistics to the same-day overall spending estimate. For example, the same-day survey provides an overall average spending, but not spending by purpose of travel. However, the overnight survey shows that travelers visiting friends or relatives (VFR) spend half the overall average. For the same-day estimates, half the overall average is assumed to be the daily spending for VFR travelers. Spending reported in Canadian dollars is converted to American dollars using Bank of Canada annual conversion rates.

Banco de Mexico and Sectur, the Mexican national tourism data source

The data provided by the Office of Travel and Tourism Industries contractor include air travel to Mexico. Data from Mexico's Sectur was used to estimate purpose of travel and average spending for non-air travel. As with the Canadian statistics, information on frequency of overnight/same-day visits and associated average spending patterns is available. Purpose of travel details for border and same-day visits were estimated based on the more detailed tables for overnight travel outside the border regions. The estimation procedures were similar to those described above for Canadian VFR traveler spending.

Algorithm Steps 3 to 5: Determine each claimant's Option 2 refund amount

Steps 3 to 5 are simple mathematical applications involving multiplication, addition, and setting a minimum refund amount.

Estimated Outcomes

For each of the survey sources describe above, surveys conducted between 1996 and 2006 were analyzed, and weighted means were calculated for annual number of travel days, percent of travel for each of the four purposes, and average total spending outside of the U.S. The table below shows the annual average number of days spent in each of the types of travel, the distribution of Purpose of Travel, and the average daily amount spent.⁶

⁶ These data are derived from surveys conducted between 1996 and 2006.

	Annual Number Days (in millions)	VFR	Leisure	Bus.	Other	Avg \$
Air Overseas and Air Mexico	369	22%	34%	36%	8%	\$97
Canada Overnight	57	19%	58%	14%	10%	\$87
Canada Same Day	25	15%	48%	6%	31%	\$41
Mexico By Land (Not Frontier)	3	83%	13%	1%	3%	\$34
Mexico Border	39	49%	45%	4%	2%	\$59
Mexico Day Trip (Including Cruise)	78	49%	45%	4%	2%	\$27
Overall	571	27%	39%	26%	8%	\$81
Average Spending		\$48	\$77	\$152	\$57	

Because the calculation of averages is sensitive to extreme values, and because Option 2 estimates are intended to reflect “typical” travel, mean daily spending amounts were adjusted to median daily spending amounts by applying median-to-mean ratios derived from data purchased from the contracting company for the Survey of International Air Travelers. The mean (from the table above) and estimated median are shown in the table below.

	Per-Day Foreign Transactions by Travel Purpose			
	VFR	Leisure	Bus.	Other
Mean	\$48	\$77	\$152	\$57
Estimated Median	\$41	\$57	\$162	\$50

The following additional adjustments are deducted from the median daily foreign transactions to accurately distinguish credit and debit card spending using Visa, MasterCard and Diners Club cards⁷:

1. Amount spent using Travelers’ Checks is deducted. Travelers’ Check spending is reported by the Survey of International Air Travelers, and 100% of Travelers’ Checks is assumed to be spent outside of the U.S.
2. Based on available industry research, the share of credit card spending assumed to be due to “other cards” is estimated to be 22% and is deducted.⁸

⁷ Additional adjustments are estimated from spending patterns reported in the U. S. Commerce Department’s Survey of International Air Travelers.

⁸ The Nilson Report conducts research and reports on consumer payment systems. “Other Cards” spending of 21.89% is estimated from The Nilson Report data on credit card market share from 1996 to 2006. The Nilson Report does not provide information on foreign transaction amounts as a separately-analyzed category. For this report, market share for cards without significant acceptance outside of the U.S., such as store cards and Discover cards, is not included in the calculations.

3. Cash spent while traveling outside of the U.S. is estimated and deducted assuming that 75% of reported cash is spent outside the U.S. The cash estimation procedure is discussed below.

The proportion of foreign spending in cash is not directly reported in the available data sources but must be estimated using responses gathered through the Survey of International Air Travelers. Ideally, the survey would specifically ask how much of reported foreign spending is completed with cash, credit card, debit card, or Traveler’s Checks. However, the survey asks how much of all trip spending (including spending within the U.S.) is attributable to each type.

In addition, the survey specifies the breakdown of all trip spending into airfare, prepaid packages, airport spending, and spending outside of the U.S. About a third to a half of trip spending (depending on purpose of travel) is spent on airline tickets or prepaid packages. It is assumed that much of typical travelers’ payment for airline or prepaid package costs is by credit card (within the U.S. and thus not the subject of the settlement), and it is assumed that cash is primarily used to be exchanged for local currencies. However, it is unlikely that all cash spending occurs outside of the U.S., and therefore reducing the amount of credit/debit card spending outside the U.S. by 100% of the reported cash expenditure is not reasonable. It is also unlikely that as little as 50% of cash spent on trips is spent outside the U.S. This estimation procedure assumes that 75% of reported cash spending occurs outside of the U.S. The result of these assumptions is that the calculations ascribe about equal amounts of cash and credit/debit card spending during travel in foreign countries. The spending that qualifies for this settlement is limited to the foreign transactions using Visa, MasterCard and Diners Club credit, charge or debit/ATM cards from February 1, 1996 to November 8, 2006.

The surveys of non-air travel into Mexico and Canada do not provide a breakdown of cash and credit card, but travel literature notes that American dollars are accepted in those sections of neighboring countries where there is significant American tourist activity. We therefore assume that cash represents a similar proportion in spending in those destinations. The estimates reflect spending from all sources, such as overseas and during same-day border trips to Mexico and Canada.

Adjusting for spending using Travelers’ Checks, “other” credit cards 22% estimated share, and cash, the median per-day foreign transaction estimates for Visa-, MasterCard- and Diners Club-branded cards are:

Per-Day Credit/Debit Card Foreign Transactions			
Median Transaction Estimates Adjusted for Travelers' Checks, Other Cards, and Cash Transactions			
VFR	Leisure	Bus.	Other
\$15	\$20	\$82	\$19

Additional Considerations - Methods of Dealing with Atypical Claims

On June 23, 2008, Heffler, Radetich & Saitta, LLP provided the current Option 2 data with identified duplicates removed. There are 2,515,286 claimants. It is expected that additional duplicates and fraudulent claims will be identified and removed prior to finalizing the claim payment estimates.

At the request of the parties, ARPC addressed the issue of alternative methods to estimate reasonable values of claims reporting atypical numbers of travel days.

For the current Option 2 data, half of the claimants report a total of approximately 82 or fewer days of travel. Some claimants report thousands of days of travel during the class period, with some claimant responses exceeding the total number of available days in the class period. Option 2 refunds are intended to be based on typical foreign travel. Extensive travel or living abroad results in atypical spending totals. If all reported days, up to the maximum in the class period, are considered, a small number of claims will be paid a large proportion of the total Option 2 refunds.

Half of the claimants report a total of 82 or fewer days of travel. Of the half of claimants who report more than 82 days, the maximum number of days in the class period is 3,934. Option 2 refunds are intended to be based on “typical spending during travel”. Extensive travel or living abroad results in atypical spending totals.

The following methods for discounting atypical travel were explored:

1. The Discount Model applies an increasing discount to travel days in excess of the median. There are 3,852 possible “excess” days (3,934 – 82). Travel day number 83 is one day in excess of the median, and is discounted by .00026 (1 divided by 3,852). Travel day number 84 is two days in excess of the median and is discounted by .00051 (2 divided by 3,852). Each additional day in excess of the median is discounted more than the previous day in a linear fashion.
2. The Decay Model applies a declining exponential curve to the discount. The model is applied starting at day 83.
3. The Discount Model Truncated at 1,000 days is similar to the first model, except the maximum discount is applied at day 1,000 and all days in excess of 999 are given the same discount.
4. The Discount Model Truncated at 500 days applies the maximum discount at day 500.
5. The Tier Model gives full value to the first 100 days, 50% of the value to days 101 to 250, 25% of the value to days 251 to 500, and 10% of the value to days in excess of 500.

6. The Discount Model with a floor at 10% of daily value applies the Discount Method described in item 1 above, but does not allow the reduction in the per-day value to fall below 10%.
7. The Decay Model with a floor at 10% of daily value does not allow the daily reduction to fall below 10%.
8. The Discount Model Truncated at 1,000 days with a floor at 10% of daily value does not allow the daily reduction to fall below 10%.
9. The Discount Model Truncated at 500 days with a floor at 10% of daily value does not allow the daily reduction to fall below 10%.

After examination of the Models and discussion of the implications of each method, the parties concluded that the Tier Model and the Decay Model were not preferable because both apply a more severe rate of reduction to days that are close to the median compared with days that are more distant. The Discount Model Truncated at 500 days also presented a steep rate of reduction. All models that allowed the value of days to drop below 10% were also considered to be less preferable than models that retained at least 10% of each day's full value. The parties considered the two most acceptable models to be:

1. The Discount Model with a floor at 10% of daily value.
2. The Discount Model Truncated at 1,000 days with a floor at 10% of daily value.