Subject: Regulation AA

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Comments:

In researching credit cards for a dictionary definition of the term "average daily balance method", I investigated the methods used to calculate the finance charge in 12 credit cards issued by six different major banks. Although the descriptions of the methods in the monthly statements differ, the actual finance charges were obtained by a single method. The relationship of this method to the average daily balance method is given by a newly discovered mathematical theorem: "The fundamental Theorem of Credit Card Interest" stated as follows - The finance charge for a billing period is exactly the same when calculated by any of three different methods: 1. Use compound interest and multiply the daily balance (actually a virtual daily balance since the interest is not actually posted to the account until the end of the billing period) at the end of the day by the daily period factor (1 + i, where i is the daily periodic rate). The finance charge is the difference between the virtual ending balance including the interest added on the final day, and the balance obtained at the end of the billing period if no interest is charged. The result is pure compound interest with interest compounded daily as historically understood except that interest is posted at the end of the billing cycle instead of daily. 2. Use

the Average Daily Balance Method but omit interest on the first day of the billing cycle and for each other day of the billing cycle add an amount of interest equal to the daily periodic rate times the previous day's ending balance. This is equivalent to adding the interest on the balance at the beginning of the day on every day except the first day and is the method described in the American Express monthly statements. However, American Express adds a disclaimer that they reserve the right to make the calculation using equivalent formulas. We assume that the formula is the much simpler formula for compound interest. Unfortunately, the test card I have from American Express has a year at 0% interest and I have not been able to test whether interest actually charged is the same as that obtained by following their explanation. However, their method obtains the exact amount of interest charged by the other five banks in the sample when computer programs are written to print out the (virtual) daily balance for every day, the cumulative daily balance for every day, and at the end of the billing cylcle the average daily balance and finally the finance charge obtained by muliplying the average daily balance by the daily periodic rate and by the days in the billing cyle. 3. Create a series of virtual daily balances found by adding interest at the end of each day. The interest is found by multiplying the daily balance at the end of the day by the daily periodic rate and is added to the balance to get the next day's beginning balance. For each billing period starting from 0, the interest is also added to a separate (virtual) cumulative interest account to get the total finance charge at the end of the billing cycle. This is the method described in two accounts from Chase and is stated to be equivalent to the average daily balance method. We assume that the real finance charge is added at the end of the last day of the cycle and that the virtual interest account starts from zero at the beginning of each billing cycle so that in effect no interest is charged on the first day of the cycle. Incredibly these three methods all yield the same finance charge. I have used computer programs to show this but this is not enough. A rigorous mathematical proof in the spirit of the Pythagorean Theorem or the Fundamental Theorems of Algebra, Arithmetic, and Calculus. In the spirit of one of my predecessors, I will state merely that I have found the most marvelous proof of the identity of the three methods in this case only using methods that are or should be known to every high school student who has taken second year algebra but time limits set by the Federal Reserve prohibit presenting it in full here. What does all this mean? Look up Occam’s Razor in your college level dictionary (it does not have to be ours) and apply it here. Since the average daily balance method as now implemented is exactly equal to compound interest, it can be swept away like Ptolemaic astronomy and replaced by the much simpler calculations of compound interest. In fact a second year algebra student should be able to balance a credit card

statement using a TI-83 plus. But there is a more ominous question to be asked here. Does the statement in Federal Reserve regulations regarding the calculation of credit card finance charges explicitly permit the use of compound interest? Apparently not and it is only because a back door was known or found connecting the two methods that the present state of affairs evolved. The methods of series and sequence manipulation used in the proofs alluded to here hark back to a course in Real Analysis taught by Shizuo Kakutani at Yale from September 1955 to June 1956. The scientific methods of citation collection and text analysis (perhaps, now better called forensic lexicography) used by Philip Babcock Gove and his editors in preparing Webster's Third New International Dictionary are at the core of comparing the credit card statements. It can truly be said that they don't make them like that anymore.