XIRR Formula

Comparison to Reg Z

The following spreadsheet shows how the XIRR function in Excel produces an APR that's consistent with the TILA APR methodology.
For ease of illustration, we have limited the Excel template for loans with no more than 52 periods. In production, Excel can handle loans with more than 52 periods.
Use case: for loans with (equal or non-equal) payments that occur at non-equal intervals. In this case, payments occur on weekdays but not weekend days.

User Input
Calculated / Linked

Section 1. Input loan terms

In Section 1, we enter the terms of the loan.

Payment Number	Date	Amount
Initial advance	2-Jan-19	-$1,000
Payment 1	3-Jan-19	$70
Payment 2	4-Jan-19	$107
Payment 3	7-Jan-19	$1
Payment 4	8-Jan-19	$200
Payment 5	9-Jan-19	$70
Payment 6	10-Jan-19	$112
Payment 7	11-Jan-19	$4
Payment 8	14-Jan-19	$136
Payment 9	15-Jan-19	$67
Payment 10	16-Jan-19	$109
Payment 11	17-Jan-19	$109
Payment 12	18-Jan-19	$92
Payment 13	0	0
Payment 14	0	0
Payment 15	0	0
Payment 16	0	0
Payment 17	0	0
Payment 18	0	0
Payment 19	0	0
Payment 20	0	0
Payment 21	0	0
Payment 22	0	0
Payment 23	0	0
Payment 24	0	0
Payment 25	0	0
Payment 26	0	0
Payment 27	0	0
Payment 28	0	0
Payment 29	0	0
Payment 30	0	0
Payment 31	0	0
Payment 32	0	0
Payment 33	0	0
Payment 34	0	0
Payment 35	0	0
Payment 36	0	0
Payment 37	0	0
Payment 38	0	0
Payment 39	0	0
Payment 40	0	0
Payment 41	0	0
Payment 42	0	0
Payment 43	0	0
Payment 44	0	0
Payment 45	0	0
Payment 46	0	0
Payment 47	0	0
Payment 48	0	0
Payment 49	0	0
Payment 50	0	0
Payment 51	0	0
Payment 52	0	0
No. of total payments	12	
Periods per year	365	

Section 2. Calculate interest using XIRR()

In Section 2, we use the XIRR function in Excel to calculate both the interest per unit period, as well as the annual APR.

Interest rate, per day	0.81%
APR	294.39%

Section 3. Setting up the Reg Z Equation

In Sections 3 and 4, we want to verify that the APR calculated from the XIRR function is in fact consistent with the TILA APR formula.

In order to do so, we will first map (in Section 3) the user inputted values about the loan to the various variables in the TILA APR formula.

$$0 = -A + \frac{P_1}{(1+i)^{t_1}} + \frac{P_2}{(1+i)^{t_2}} + \ldots + \frac{P_n}{(1+i)^{t_n}}$$

$$APR = i * m$$

	Payment Variables	Value	Date Variable	Value	Source
Initial advance	A	-$1,000.00	N/A	N/A	User input (Section 1)
Payment 1	P1	$70.00	t1	1	User input (Section 1)
Payment 2	P2	$107.00	t2	2	User input (Section 1)
Payment 3	P3	$1.00	t3	5	User input (Section 1)
Payment 4	P4	$200.00	t4	6	User input (Section 1)
Payment 5	P5	$70.00	t5	7	User input (Section 1)
Payment 6	P6	$112.00	t6	8	User input (Section 1)
Payment 7	P7	$4.00	t7	9	User input (Section 1)
Payment 8	P8	$136.00	t8	12	User input (Section 1)
Payment 9	P9	$67.00	t9	13	User input (Section 1)
Payment 10	P10	$109.00	t10	14	User input (Section 1)
Payment 11	P11	$109.00	t11	15	User input (Section 1)
Payment 12	P12	$92.00	t12	16	User input (Section 1)
Payment 13	P13	$0.00	t13	0	User input (Section 1)

Payment 14	P14	$0.00	t14	0	User input (Section 1)
Payment 15	P15	$0.00	t15	0	User input (Section 1)
Payment 16	P16	$0.00	t16	0	User input (Section 1)
Payment 17	P17	$0.00	t17	0	User input (Section 1)
Payment 18	P18	$0.00	t18	0	User input (Section 1)
Payment 19	P19	$0.00	t19	0	User input (Section 1)
Payment 20	P20	$0.00	t20	0	User input (Section 1)
Payment 21	P21	$0.00	t21	0	User input (Section 1)
Payment 22	P22	$0.00	t22	0	User input (Section 1)
Payment 23	P23	$0.00	t23	0	User input (Section 1)
Payment 24	P24	$0.00	t24	0	User input (Section 1)
Payment 25	P25	$0.00	t25	0	User input (Section 1)
Payment 26	P26	$0.00	t26	0	User input (Section 1)
Payment 27	P27	$0.00	t27	0	User input (Section 1)
Payment 28	P28	$0.00	t28	0	User input (Section 1)
Payment 29	P29	$0.00	t29	0	User input (Section 1)
Payment 30	P30	$0.00	t30	0	User input (Section 1)
Payment 31	P31	$0.00	t31	0	User input (Section 1)
Payment 32	P32	$0.00	t32	0	User input (Section 1)
Payment 33	P33	$0.00	t33	0	User input (Section 1)
Payment 34	P34	$0.00	t34	0	User input (Section 1)
Payment 35	P35	$0.00	t35	0	User input (Section 1)
Payment 36	P36	$0.00	t36	0	User input (Section 1)
Payment 37	P37	$0.00	t37	0	User input (Section 1)
Payment 38	P38	$0.00	t38	0	User input (Section 1)
Payment 39	P39	$0.00	t39	0	User input (Section 1)
Payment 40	P40	$0.00	t40	0	User input (Section 1)
Payment 41	P41	$0.00	t41	0	User input (Section 1)
Payment 42	P42	$0.00	t42	0	User input (Section 1)
Payment 43	P43	$0.00	t43	0	User input (Section 1)
Payment 44	P44	$0.00	t44	0	User input (Section 1)
Payment 45	P45	$0.00	t45	0	User input (Section 1)
Payment 46	P46	$0.00	t46	0	User input (Section 1)
Payment 47	P47	$0.00	t47	0	User input (Section 1)
Payment 48	P48	$0.00	t48	0	User input (Section 1)
Payment 49	P49	$0.00	t49	0	User input (Section 1)
Payment 50	P50	$0.00	t50	0	User input (Section 1)
Payment 51	P51	$0.00	t51	0	User input (Section 1)
Payment 52	P52	$0.00	t52	0	User input (Section 1)
Interest per period	i	0.81%			Calculated (Section 2)
Periods per year	m	365			Calculated (Section 1)

Section 4. Confirm Reg Z is Satisfied

In Section 4, we will plug the APR obtained from the Excel formula into the TILA APR formula to show the mathematical conditions are met. This is shown by taking the sum off all the values and showing it equals zero. Since cell J147 is zero, we have shown that the APR calculated by Excel is consistent with the TILA APR.

Date	Amount	Reg Z Calculation
2-Jan-19	-$1,000.00	-$1,000.00
3-Jan-19	$70.00	$69.44
4-Jan-19	$107.00	$105.29
7-Jan-19	$1.00	$0.96
8-Jan-19	$200.00	$190.59
9-Jan-19	$70.00	$66.17
10-Jan-19	$112.00	$105.03
11-Jan-19	$4.00	$3.72
14-Jan-19	$136.00	$123.50
15-Jan-19	$67.00	$60.36
16-Jan-19	$109.00	$97.41
17-Jan-19	$109.00	$96.63
18-Jan-19	$92.00	$80.90
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00
0-Jan-00	$0.00	$0.00

Sum	0.00
Is sum zero (nearest cent)	Yes
Satisfies Reg Z	Yes