**程式作業1: 分期償還表**

C109152304 許智程

1. 假設你跟銀行借了20年期的700萬房屋貸款，年利率1.8%，試擬出其分期償還表
2. 程式碼-採用本息平均攤還法

from decimal import Decimal

import pandas

import numpy

# 本息平均攤還法

def equalTotalPayment(principal: float, percent: float, year: int):

    principal, percent = Decimal(principal), Decimal(percent)

    # 期數(以月計算)

    n = year \* 12

    # 每月應付本息金額之平均攤還率

    # 已知年金現值(Present value of annuity，PVOA)=PMT\*PVIFA

    # 則PMT=PVOA/PVIFA

    u = sum([1 / ((1 + percent \* 1 / 100 \* 1 / 12) \*\* (i + 1)) for i in range(n)])

    # 每月繳款金額

    a = principal / u

    tableBegin, tableEnd = [], []

    tableA, tableB, tableC = [a for \_ in range(n)], [], []

    for \_ in range(n):

        # 每月償還利息

        b = round(principal \* percent \* 1 / 100 \* 1 / 12, 0)

        tableB.append(b)

        # 每月償還本金

        c = a - b

        tableC.append(c)

        # 期末餘額

        iterFinal = principal - c

        tableEnd.append(iterFinal)

        tableBegin.append(principal)

        principal = iterFinal

    table = pandas.DataFrame(

        {

            "期數": [\*range(1, n + 1)],

            "期初金額": tableBegin,

            "每期支付額": tableA,

            "利息費用": tableB,

            "本金償還": tableC,

            "期末欠款": tableEnd,

        }

    )

    table.loc[len(table)] = [

        "總計",

        numpy.nan,

        \*[table[col].sum() for col in table.columns.values[2:-1]],

        0,

    ]

    for col in table.columns.values:

        table[col] = table[col].apply(

            lambda x: round(x, 0) if isinstance(x, Decimal) else x

        )

    table.to\_csv("./result.csv", index=False)

equalTotalPayment(7000000, 1.8, 20)

1. 分期償還表

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 期數 | 期初金額 | 每期支付額 | 利息費用 | 本金償還 | 期末欠款 |
| 1 | 7000000 | 34753 | 10500 | 24253 | 6975747 |
| 2 | 6975747 | 34753 | 10464 | 24289 | 6951459 |
| 3 | 6951459 | 34753 | 10427 | 24326 | 6927133 |
| 4 | 6927133 | 34753 | 10391 | 24362 | 6902772 |
| 5 | 6902772 | 34753 | 10354 | 24399 | 6878373 |
| 6 | 6878373 | 34753 | 10318 | 24435 | 6853938 |
| 7 | 6853938 | 34753 | 10281 | 24472 | 6829467 |
| 8 | 6829467 | 34753 | 10244 | 24509 | 6804958 |
| 9 | 6804958 | 34753 | 10207 | 24546 | 6780412 |
| 10 | 6780412 | 34753 | 10171 | 24582 | 6755831 |
| 11 | 6755831 | 34753 | 10134 | 24619 | 6731212 |
| 12 | 6731212 | 34753 | 10097 | 24656 | 6706557 |
| 13 | 6706557 | 34753 | 10060 | 24693 | 6681864 |
| 14 | 6681864 | 34753 | 10023 | 24730 | 6657134 |
| 15 | 6657134 | 34753 | 9986 | 24767 | 6632368 |
| 16 | 6632368 | 34753 | 9949 | 24804 | 6607564 |
| 17 | 6607564 | 34753 | 9911 | 24842 | 6582722 |
| 18 | 6582722 | 34753 | 9874 | 24879 | 6557844 |
| 19 | 6557844 | 34753 | 9837 | 24916 | 6532928 |
| 20 | 6532928 | 34753 | 9799 | 24954 | 6507975 |
| 21 | 6507975 | 34753 | 9762 | 24991 | 6482984 |
| 22 | 6482984 | 34753 | 9724 | 25029 | 6457955 |
| 23 | 6457955 | 34753 | 9687 | 25066 | 6432890 |
| 24 | 6432890 | 34753 | 9649 | 25104 | 6407786 |
| 25 | 6407786 | 34753 | 9612 | 25141 | 6382645 |
| 26 | 6382645 | 34753 | 9574 | 25179 | 6357467 |
| 27 | 6357467 | 34753 | 9536 | 25217 | 6332250 |
| 28 | 6332250 | 34753 | 9498 | 25255 | 6306996 |
| 29 | 6306996 | 34753 | 9460 | 25293 | 6281703 |
| 30 | 6281703 | 34753 | 9423 | 25330 | 6256373 |
| 31 | 6256373 | 34753 | 9385 | 25368 | 6231006 |
| 32 | 6231006 | 34753 | 9347 | 25406 | 6205600 |
| 33 | 6205600 | 34753 | 9308 | 25445 | 6180155 |
| 34 | 6180155 | 34753 | 9270 | 25483 | 6154673 |
| 35 | 6154673 | 34753 | 9232 | 25521 | 6129152 |
| 36 | 6129152 | 34753 | 9194 | 25559 | 6103594 |
| 37 | 6103594 | 34753 | 9155 | 25598 | 6077996 |
| 38 | 6077996 | 34753 | 9117 | 25636 | 6052360 |
| 39 | 6052360 | 34753 | 9079 | 25674 | 6026687 |
| 40 | 6026687 | 34753 | 9040 | 25713 | 6000974 |
| 41 | 6000974 | 34753 | 9001 | 25752 | 5975222 |
| 42 | 5975222 | 34753 | 8963 | 25790 | 5949433 |
| 43 | 5949433 | 34753 | 8924 | 25829 | 5923604 |
| 44 | 5923604 | 34753 | 8885 | 25868 | 5897737 |
| 45 | 5897737 | 34753 | 8847 | 25906 | 5871831 |
| 46 | 5871831 | 34753 | 8808 | 25945 | 5845886 |
| 47 | 5845886 | 34753 | 8769 | 25984 | 5819903 |
| 48 | 5819903 | 34753 | 8730 | 26023 | 5793880 |
| 49 | 5793880 | 34753 | 8691 | 26062 | 5767818 |
| 50 | 5767818 | 34753 | 8652 | 26101 | 5741718 |
| 51 | 5741718 | 34753 | 8613 | 26140 | 5715578 |
| 52 | 5715578 | 34753 | 8573 | 26180 | 5689399 |
| 53 | 5689399 | 34753 | 8534 | 26219 | 5663180 |
| 54 | 5663180 | 34753 | 8495 | 26258 | 5636922 |
| 55 | 5636922 | 34753 | 8455 | 26298 | 5610625 |
| 56 | 5610625 | 34753 | 8416 | 26337 | 5584288 |
| 57 | 5584288 | 34753 | 8376 | 26377 | 5557911 |
| 58 | 5557911 | 34753 | 8337 | 26416 | 5531496 |
| 59 | 5531496 | 34753 | 8297 | 26456 | 5505040 |
| 60 | 5505040 | 34753 | 8258 | 26495 | 5478546 |
| 61 | 5478546 | 34753 | 8218 | 26535 | 5452011 |
| 62 | 5452011 | 34753 | 8178 | 26575 | 5425436 |
| 63 | 5425436 | 34753 | 8138 | 26615 | 5398822 |
| 64 | 5398822 | 34753 | 8098 | 26655 | 5372167 |
| 65 | 5372167 | 34753 | 8058 | 26695 | 5345472 |
| 66 | 5345472 | 34753 | 8018 | 26735 | 5318738 |
| 67 | 5318738 | 34753 | 7978 | 26775 | 5291963 |
| 68 | 5291963 | 34753 | 7938 | 26815 | 5265149 |
| 69 | 5265149 | 34753 | 7898 | 26855 | 5238294 |
| 70 | 5238294 | 34753 | 7857 | 26896 | 5211398 |
| 71 | 5211398 | 34753 | 7817 | 26936 | 5184463 |
| 72 | 5184463 | 34753 | 7777 | 26976 | 5157487 |
| 73 | 5157487 | 34753 | 7736 | 27017 | 5130470 |
| 74 | 5130470 | 34753 | 7696 | 27057 | 5103414 |
| 75 | 5103414 | 34753 | 7655 | 27098 | 5076316 |
| 76 | 5076316 | 34753 | 7614 | 27139 | 5049178 |
| 77 | 5049178 | 34753 | 7574 | 27179 | 5021999 |
| 78 | 5021999 | 34753 | 7533 | 27220 | 4994779 |
| 79 | 4994779 | 34753 | 7492 | 27261 | 4967519 |
| 80 | 4967519 | 34753 | 7451 | 27302 | 4940217 |
| 81 | 4940217 | 34753 | 7410 | 27343 | 4912875 |
| 82 | 4912875 | 34753 | 7369 | 27384 | 4885491 |
| 83 | 4885491 | 34753 | 7328 | 27425 | 4858066 |
| 84 | 4858066 | 34753 | 7287 | 27466 | 4830601 |
| 85 | 4830601 | 34753 | 7246 | 27507 | 4803094 |
| 86 | 4803094 | 34753 | 7205 | 27548 | 4775546 |
| 87 | 4775546 | 34753 | 7163 | 27590 | 4747957 |
| 88 | 4747957 | 34753 | 7122 | 27631 | 4720326 |
| 89 | 4720326 | 34753 | 7080 | 27673 | 4692654 |
| 90 | 4692654 | 34753 | 7039 | 27714 | 4664940 |
| 91 | 4664940 | 34753 | 6997 | 27756 | 4637184 |
| 92 | 4637184 | 34753 | 6956 | 27797 | 4609388 |
| 93 | 4609388 | 34753 | 6914 | 27839 | 4581549 |
| 94 | 4581549 | 34753 | 6872 | 27881 | 4553668 |
| 95 | 4553668 | 34753 | 6831 | 27922 | 4525747 |
| 96 | 4525747 | 34753 | 6789 | 27964 | 4497783 |
| 97 | 4497783 | 34753 | 6747 | 28006 | 4469778 |
| 98 | 4469778 | 34753 | 6705 | 28048 | 4441730 |
| 99 | 4441730 | 34753 | 6663 | 28090 | 4413640 |
| 100 | 4413640 | 34753 | 6620 | 28133 | 4385508 |
| 101 | 4385508 | 34753 | 6578 | 28175 | 4357333 |
| 102 | 4357333 | 34753 | 6536 | 28217 | 4329116 |
| 103 | 4329116 | 34753 | 6494 | 28259 | 4300858 |
| 104 | 4300858 | 34753 | 6451 | 28302 | 4272556 |
| 105 | 4272556 | 34753 | 6409 | 28344 | 4244213 |
| 106 | 4244213 | 34753 | 6366 | 28387 | 4215826 |
| 107 | 4215826 | 34753 | 6324 | 28429 | 4187397 |
| 108 | 4187397 | 34753 | 6281 | 28472 | 4158926 |
| 109 | 4158926 | 34753 | 6238 | 28515 | 4130411 |
| 110 | 4130411 | 34753 | 6196 | 28557 | 4101854 |
| 111 | 4101854 | 34753 | 6153 | 28600 | 4073255 |
| 112 | 4073255 | 34753 | 6110 | 28643 | 4044612 |
| 113 | 4044612 | 34753 | 6067 | 28686 | 4015927 |
| 114 | 4015927 | 34753 | 6024 | 28729 | 3987198 |
| 115 | 3987198 | 34753 | 5981 | 28772 | 3958426 |
| 116 | 3958426 | 34753 | 5938 | 28815 | 3929612 |
| 117 | 3929612 | 34753 | 5894 | 28859 | 3900753 |
| 118 | 3900753 | 34753 | 5851 | 28902 | 3871851 |
| 119 | 3871851 | 34753 | 5808 | 28945 | 3842907 |
| 120 | 3842907 | 34753 | 5764 | 28989 | 3813918 |
| 121 | 3813918 | 34753 | 5721 | 29032 | 3784887 |
| 122 | 3784887 | 34753 | 5677 | 29076 | 3755811 |
| 123 | 3755811 | 34753 | 5634 | 29119 | 3726692 |
| 124 | 3726692 | 34753 | 5590 | 29163 | 3697530 |
| 125 | 3697530 | 34753 | 5546 | 29207 | 3668323 |
| 126 | 3668323 | 34753 | 5502 | 29251 | 3639072 |
| 127 | 3639072 | 34753 | 5459 | 29294 | 3609779 |
| 128 | 3609779 | 34753 | 5415 | 29338 | 3580441 |
| 129 | 3580441 | 34753 | 5371 | 29382 | 3551060 |
| 130 | 3551060 | 34753 | 5327 | 29426 | 3521634 |
| 131 | 3521634 | 34753 | 5282 | 29471 | 3492163 |
| 132 | 3492163 | 34753 | 5238 | 29515 | 3462649 |
| 133 | 3462649 | 34753 | 5194 | 29559 | 3433090 |
| 134 | 3433090 | 34753 | 5150 | 29603 | 3403487 |
| 135 | 3403487 | 34753 | 5105 | 29648 | 3373840 |
| 136 | 3373840 | 34753 | 5061 | 29692 | 3344148 |
| 137 | 3344148 | 34753 | 5016 | 29737 | 3314412 |
| 138 | 3314412 | 34753 | 4972 | 29781 | 3284631 |
| 139 | 3284631 | 34753 | 4927 | 29826 | 3254805 |
| 140 | 3254805 | 34753 | 4882 | 29871 | 3224935 |
| 141 | 3224935 | 34753 | 4837 | 29916 | 3195019 |
| 142 | 3195019 | 34753 | 4793 | 29960 | 3165059 |
| 143 | 3165059 | 34753 | 4748 | 30005 | 3135055 |
| 144 | 3135055 | 34753 | 4703 | 30050 | 3105005 |
| 145 | 3105005 | 34753 | 4658 | 30095 | 3074911 |
| 146 | 3074911 | 34753 | 4612 | 30141 | 3044770 |
| 147 | 3044770 | 34753 | 4567 | 30186 | 3014584 |
| 148 | 3014584 | 34753 | 4522 | 30231 | 2984354 |
| 149 | 2984354 | 34753 | 4477 | 30276 | 2954078 |
| 150 | 2954078 | 34753 | 4431 | 30322 | 2923756 |
| 151 | 2923756 | 34753 | 4386 | 30367 | 2893390 |
| 152 | 2893390 | 34753 | 4340 | 30413 | 2862977 |
| 153 | 2862977 | 34753 | 4294 | 30459 | 2832519 |
| 154 | 2832519 | 34753 | 4249 | 30504 | 2802015 |
| 155 | 2802015 | 34753 | 4203 | 30550 | 2771465 |
| 156 | 2771465 | 34753 | 4157 | 30596 | 2740870 |
| 157 | 2740870 | 34753 | 4111 | 30642 | 2710228 |
| 158 | 2710228 | 34753 | 4065 | 30688 | 2679541 |
| 159 | 2679541 | 34753 | 4019 | 30734 | 2648807 |
| 160 | 2648807 | 34753 | 3973 | 30780 | 2618027 |
| 161 | 2618027 | 34753 | 3927 | 30826 | 2587202 |
| 162 | 2587202 | 34753 | 3881 | 30872 | 2556330 |
| 163 | 2556330 | 34753 | 3834 | 30919 | 2525411 |
| 164 | 2525411 | 34753 | 3788 | 30965 | 2494447 |
| 165 | 2494447 | 34753 | 3742 | 31011 | 2463436 |
| 166 | 2463436 | 34753 | 3695 | 31058 | 2432379 |
| 167 | 2432379 | 34753 | 3649 | 31104 | 2401275 |
| 168 | 2401275 | 34753 | 3602 | 31151 | 2370124 |
| 169 | 2370124 | 34753 | 3555 | 31198 | 2338927 |
| 170 | 2338927 | 34753 | 3508 | 31245 | 2307682 |
| 171 | 2307682 | 34753 | 3462 | 31291 | 2276391 |
| 172 | 2276391 | 34753 | 3415 | 31338 | 2245054 |
| 173 | 2245054 | 34753 | 3368 | 31385 | 2213669 |
| 174 | 2213669 | 34753 | 3321 | 31432 | 2182238 |
| 175 | 2182238 | 34753 | 3273 | 31480 | 2150758 |
| 176 | 2150758 | 34753 | 3226 | 31527 | 2119231 |
| 177 | 2119231 | 34753 | 3179 | 31574 | 2087658 |
| 178 | 2087658 | 34753 | 3131 | 31622 | 2056036 |
| 179 | 2056036 | 34753 | 3084 | 31669 | 2024367 |
| 180 | 2024367 | 34753 | 3037 | 31716 | 1992652 |
| 181 | 1992652 | 34753 | 2989 | 31764 | 1960888 |
| 182 | 1960888 | 34753 | 2941 | 31812 | 1929077 |
| 183 | 1929077 | 34753 | 2894 | 31859 | 1897218 |
| 184 | 1897218 | 34753 | 2846 | 31907 | 1865311 |
| 185 | 1865311 | 34753 | 2798 | 31955 | 1833357 |
| 186 | 1833357 | 34753 | 2750 | 32003 | 1801354 |
| 187 | 1801354 | 34753 | 2702 | 32051 | 1769303 |
| 188 | 1769303 | 34753 | 2654 | 32099 | 1737205 |
| 189 | 1737205 | 34753 | 2606 | 32147 | 1705058 |
| 190 | 1705058 | 34753 | 2558 | 32195 | 1672864 |
| 191 | 1672864 | 34753 | 2509 | 32244 | 1640620 |
| 192 | 1640620 | 34753 | 2461 | 32292 | 1608328 |
| 193 | 1608328 | 34753 | 2412 | 32341 | 1575988 |
| 194 | 1575988 | 34753 | 2364 | 32389 | 1543599 |
| 195 | 1543599 | 34753 | 2315 | 32438 | 1511161 |
| 196 | 1511161 | 34753 | 2267 | 32486 | 1478676 |
| 197 | 1478676 | 34753 | 2218 | 32535 | 1446141 |
| 198 | 1446141 | 34753 | 2169 | 32584 | 1413558 |
| 199 | 1413558 | 34753 | 2120 | 32633 | 1380925 |
| 200 | 1380925 | 34753 | 2071 | 32682 | 1348243 |
| 201 | 1348243 | 34753 | 2022 | 32731 | 1315513 |
| 202 | 1315513 | 34753 | 1973 | 32780 | 1282733 |
| 203 | 1282733 | 34753 | 1924 | 32829 | 1249904 |
| 204 | 1249904 | 34753 | 1875 | 32878 | 1217027 |
| 205 | 1217027 | 34753 | 1826 | 32927 | 1184100 |
| 206 | 1184100 | 34753 | 1776 | 32977 | 1151124 |
| 207 | 1151124 | 34753 | 1727 | 33026 | 1118098 |
| 208 | 1118098 | 34753 | 1677 | 33076 | 1085022 |
| 209 | 1085022 | 34753 | 1628 | 33125 | 1051898 |
| 210 | 1051898 | 34753 | 1578 | 33175 | 1018723 |
| 211 | 1018723 | 34753 | 1528 | 33225 | 985498 |
| 212 | 985498 | 34753 | 1478 | 33275 | 952224 |
| 213 | 952224 | 34753 | 1428 | 33325 | 918899 |
| 214 | 918899 | 34753 | 1378 | 33375 | 885525 |
| 215 | 885525 | 34753 | 1328 | 33425 | 852100 |
| 216 | 852100 | 34753 | 1278 | 33475 | 818625 |
| 217 | 818625 | 34753 | 1228 | 33525 | 785101 |
| 218 | 785101 | 34753 | 1178 | 33575 | 751526 |
| 219 | 751526 | 34753 | 1127 | 33626 | 717900 |
| 220 | 717900 | 34753 | 1077 | 33676 | 684225 |
| 221 | 684225 | 34753 | 1026 | 33727 | 650498 |
| 222 | 650498 | 34753 | 976 | 33777 | 616722 |
| 223 | 616722 | 34753 | 925 | 33828 | 582894 |
| 224 | 582894 | 34753 | 874 | 33879 | 549015 |
| 225 | 549015 | 34753 | 824 | 33929 | 515087 |
| 226 | 515087 | 34753 | 773 | 33980 | 481107 |
| 227 | 481107 | 34753 | 722 | 34031 | 447076 |
| 228 | 447076 | 34753 | 671 | 34082 | 412995 |
| 229 | 412995 | 34753 | 619 | 34134 | 378861 |
| 230 | 378861 | 34753 | 568 | 34185 | 344677 |
| 231 | 344677 | 34753 | 517 | 34236 | 310441 |
| 232 | 310441 | 34753 | 466 | 34287 | 276154 |
| 233 | 276154 | 34753 | 414 | 34339 | 241816 |
| 234 | 241816 | 34753 | 363 | 34390 | 207426 |
| 235 | 207426 | 34753 | 311 | 34442 | 172985 |
| 236 | 172985 | 34753 | 259 | 34494 | 138491 |
| 237 | 138491 | 34753 | 208 | 34545 | 103946 |
| 238 | 103946 | 34753 | 156 | 34597 | 69350 |
| 239 | 69350 | 34753 | 104 | 34649 | 34701 |
| 240 | 34701 | 34753 | 52 | 34701 | 0 |
| 總計 |  | 8340630 | 1340630 | 7000000 | 0 |