CCIM History
by the Decades

The Calculators

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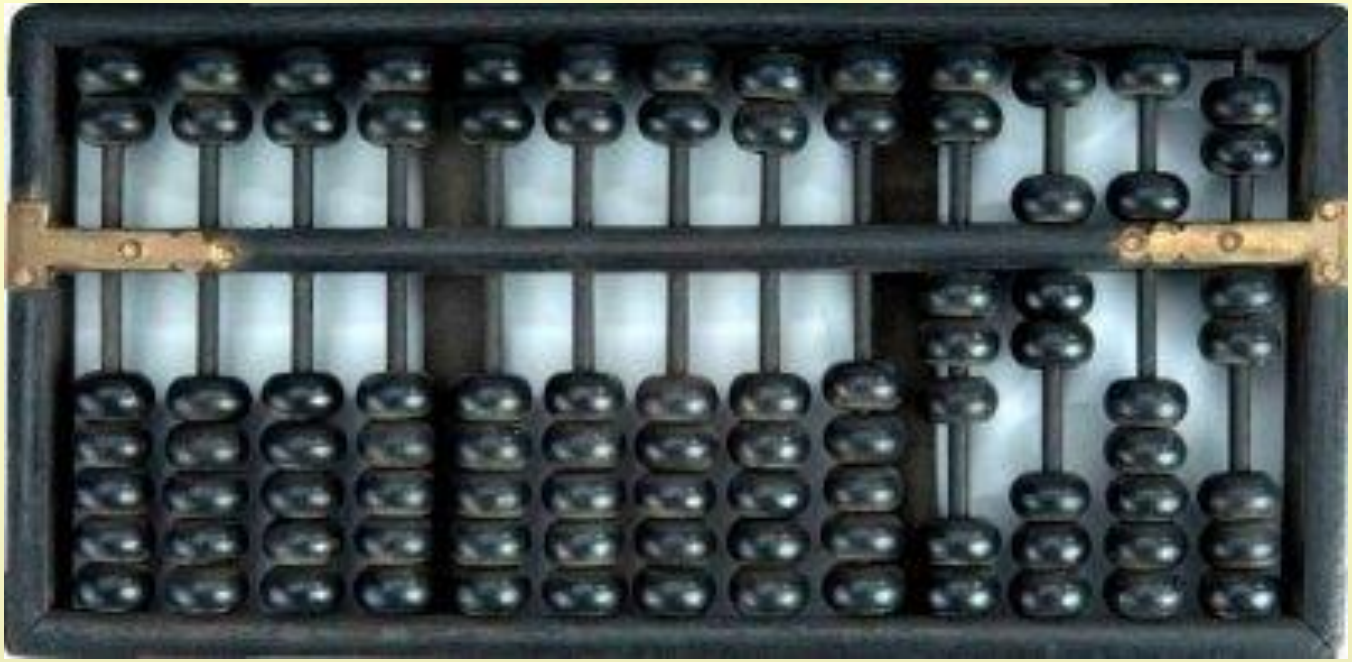
The Calculations

There is evidence that interest was calculated and charged for purchases of goods and for loans as early as c. 5000 BC, if not earlier, and records indicate rates of 10–25 percent. (Wikipedia)

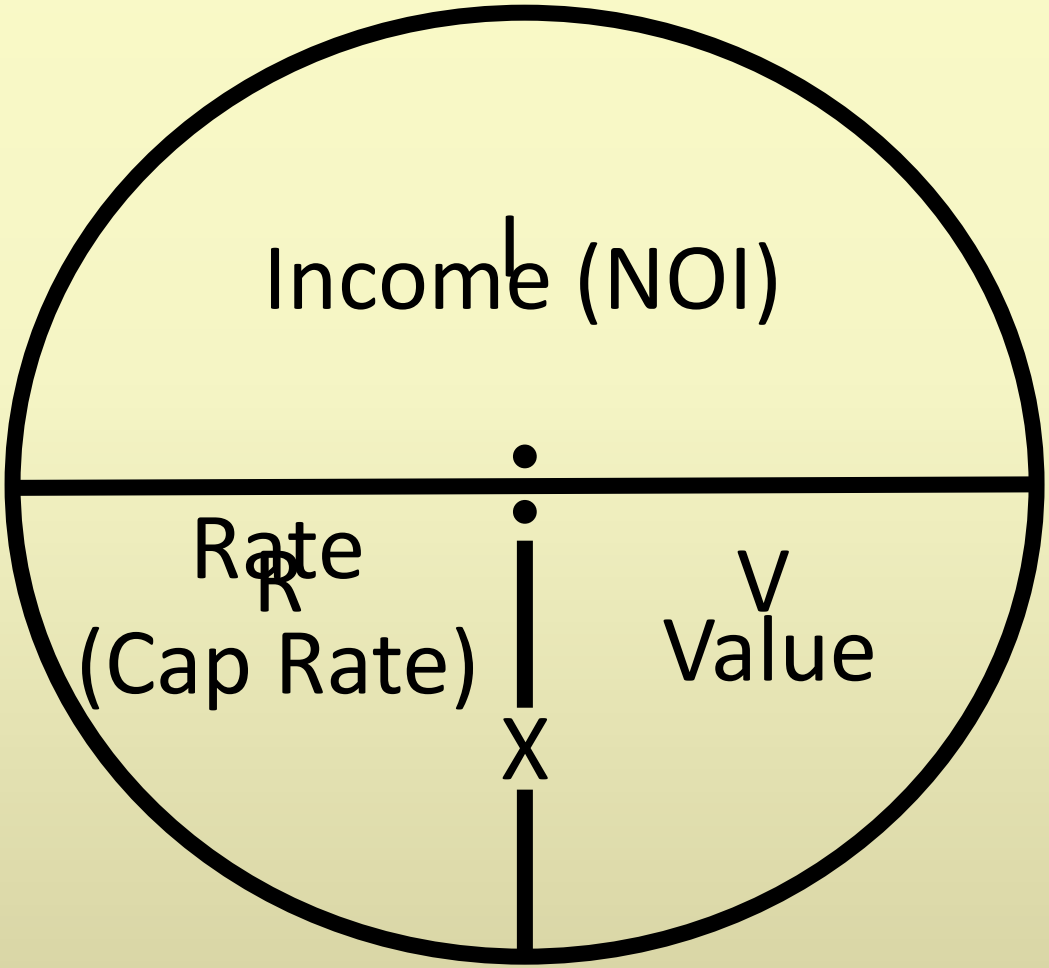


1st known calculator – The Abacus 2700–2300 BC in Sumeria, then to Egypt, Greece and China

A main concern of ours in Commercial Real Estate is the Capital Market (CI-101)

- Investors Acquire Buildings
- Value Based On Return
- Relationship of Value to NOI
- Supply and Demand Determine NOI

Capital Market & Cap Rates



$I = R \times V$

$R = I / V$

$V = I / R$

The Anatomy of a Cap Rate*

- Cap rate quantification began with L. W. Ellwood an appraiser in NJ
- "Ellwood Tables for Real Estate Appraising and Financing" first published in 1959
- One basic flaw of Ellwood's formula is it's complexity
- Charles Akerson simplified it in 1970 with Band of Investment theory

*Marketing Investment Real Estate-Finance Taxation Techniques by Messner, Schreiber, Lyon & Ward

Calculators from 1940 through 1975

Monroe-High speed adding calculator-1940

https://www.dropbox.com/s/d7okb0db8n5nwy2/HP%20Computer%20Video%20Clip.mpg?dl=0

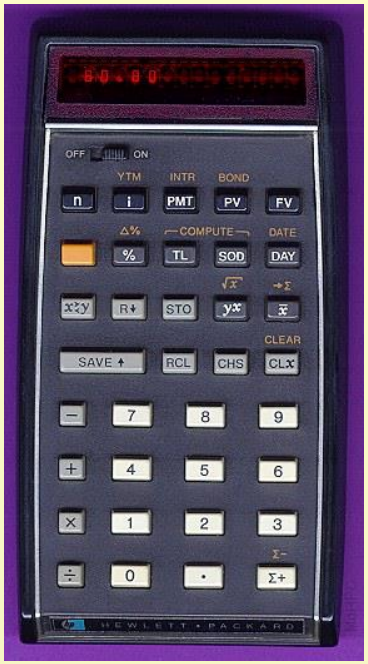
Let’s take a quick look at the Ellwood tables and please stay awake!

5% MONTHLY COMPOUND INTEREST TABLE 5%

EFFECTIVE RATE = 5/12% **BASE = 1.00416666+**

MONTHS	1 AMOUNT OF 1 AT COMPOUND INTEREST $S^n = (1+i)^n$	2 ACCUMULATION OF 1 PER PERIOD $S_{\overline{n}|} = \frac{S^n - 1}{i}$	3 SINKING FUND FACTOR $1\ S_{\overline{n}|} = \frac{i}{S^n - 1}$	4 PRES. VALUE REVERSION OF 1 $V^n = \frac{1}{S^n}$	5 PRESENT VALUE ORD. ANNUITY 1 PER PERIOD $a_{\overline{n}|} = \frac{1 - V^n}{i}$	6 INSTALMENT TO AMORTIZE 1 $1\ a_{\overline{n}|} = \frac{i}{1 - V^n}$	n MONTHS
1	1.004167	1.000000	1.000000	.995851	.995851	1.004167	1
2	1.008351	2.004167	.498960	.991718	1.987569	.503127	2
3	1.012552	3.012517	.331948	.987603	2.975173	.336115	3
4	1.016771	4.025070	.248443	.983506	3.958678	.252610	4
5	1.021008	5.041841	.198340	.979425	4.938103	.202507	5
6	1.025262	6.062848	.164939	.975361	5.913463	.169106	6
7	1.029534	7.088110	.141081	.971313	6.884777	.145248	7
8	1.033824	8.117644	.123188	.967283	7.852060	.127355	8
9	1.038131	9.151467	.109272	.963269	8.815329	.113439	9
10	1.042457	10.189599	.098139	.959272	9.774602	.102306	10
11	1.046800	11.232055	.089031	.955292	10.729894	.093198	11
YEARS							
1	1.051162	12.278855	.081441	.951328	11.681222	.085608	12
2	1.104941	25.185921	.039705	.905025	22.793898	.043872	24
3	1.161472	38.753336	.025804	.860976	33.365701	.029971	36
4	1.220895	53.014885	.018863	.819071	43.422956	.023030	48
5	1.283359	68.006083	.014705	.779205	52.990706	.018872	60
6	1.349018	83.764259	.011938	.741280	62.092777	.016105	72
7	1.418036	100.328653	.009967	.705201	70.751835	.014134	84
8	1.490585	117.740513	.008493	.670877	78.989441	.012660	96
9	1.566847	136.043196	.007351	.638225	86.826108	.011518	108
10	1.647010	155.282280	.006440	.607161	94.281350	.010607	120
11	1.731274	175.505671	.005698	.577609	101.373733	.009865	132
12	1.819849	196.763730	.005082	.549496	108.120917	.009249	144
13	1.912956	219.109392	.004564	.522751	114.539704	.008731	156
14	2.010826	242.598300	.004122	.497308	120.646077	.008289	168
15	2.113704	267.288945	.003741	.473103	126.455243	.007908	180
16	2.221845	293.242810	.003410	.450076	131.981666	.007577	192
17	2.335519	320.524524	.003120	.428170	137.239108	.007287	204
18	2.455008	349.202023	.002864	.407331	142.240661	.007031	216
19	2.580611	379.346717	.002636	.387505	146.998780	.006803	228
20	2.712640	411.033670	.002433	.368645	151.525313	.006600	240

- **<u>Column 1</u> – Amount of 1 at compound interest**
  Example – What will $10,000 grow to in 20 years at 5% compounded monthly?
  ($10,000 x 2.712640 = $27,126.40)
- **<u>Column 2</u> – Accumulation of 1 per period**
  Example – If I deposit $1,000/mo. For 20 years at 5% what is the future value?
  ($1,000 x 411.033670 = $411,033.67)
- **<u>Column 3</u> - Sinking Fund factor**
  Example – How much to put in every month to grow to $100,000 in 20 years at 5%?
  ($100,000 x .002433 = $243.29)
- **<u>Column 4</u> – Present value reversion of 1**
  Example - How much to pay for a bond that will be worth $100,000 in 20 years, paying 5%? (discounting) ($100,000 x .368645 = $36,864.45)
- **<u>Column 5</u> – Present value ordinary annuity 1 per period**
  Example – Annuity pays $300/mo. at 5% over 20 years, how much do you pay for it? PV?
  ($300 x 151.525313 = $45,457.59)
- **<u>Column 6</u> – Installment to Amortize 1**
  Example – What's the monthly payment to amortize a $100,000 loan at 5%, monthly, 20 years? ($100,000 x .006600 = $659.95)

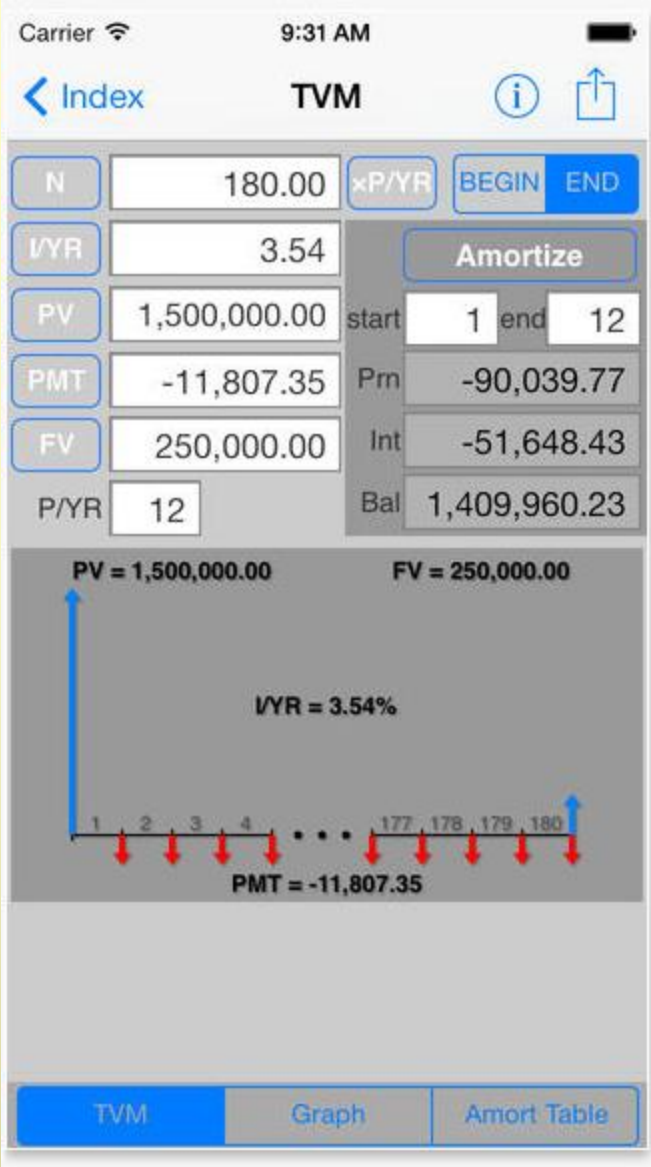


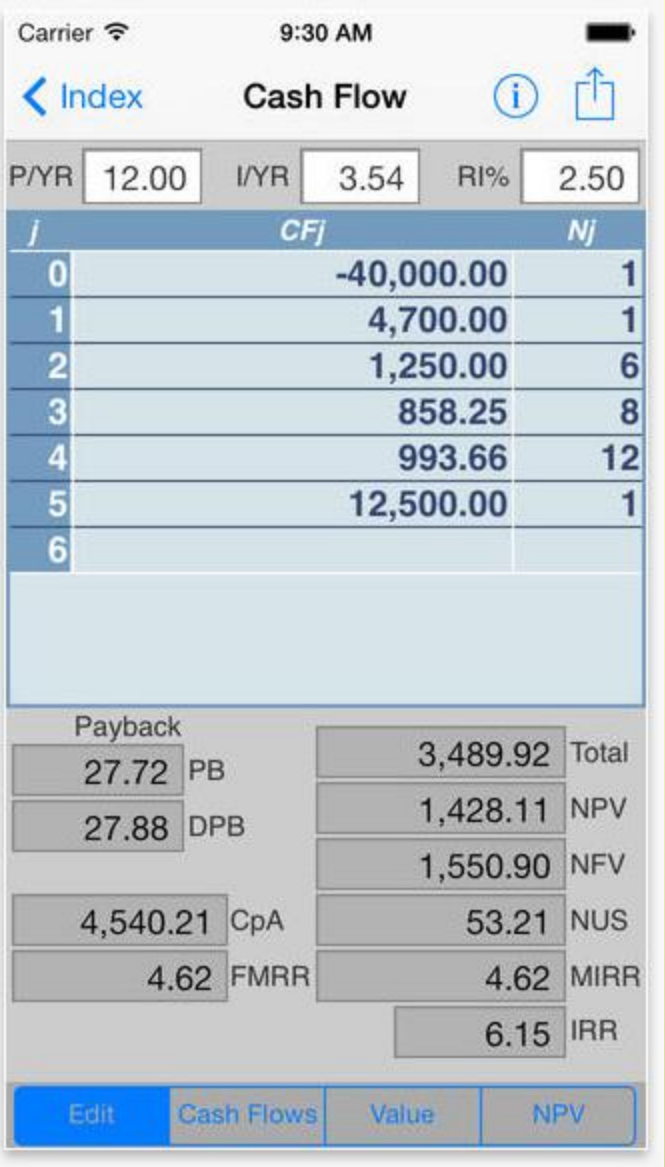
HP-80 $400 (1973) wt. 8.7 oz.

HP-12C $69 (1981)

HP-10B II+ $19-$29 (2001)

HP 10BII for iPhone $5.99 (2009)


Carrier
9:31 AM
Index
TVM
N
180.00
×P/YR
BEGIN
END
I/YR
3.54
Amortize
PV
1,500,000.00
start
1
end
12
PMT
-11,807.35
Prn
-90,039.77
FV
250,000.00
Int
-51,648.43
P/YR
12
Bal
1,409,960.23
PV = 1,500,000.00
FV = 250,000.00
I/YR = 3.54%
1
2
3
4
177
178
179
180
PMT = -11,807.35
TVM
Graph
Amort Table


Carrier
9:30 AM
Index
Cash Flow
P/YR
12.00
I/YR
3.54
RI%
2.50
j
CFj
Nj
0
-40,000.00
1
1
4,700.00
1
2
1,250.00
6
3
858.25
8
4
993.66
12
5
12,500.00
1
6
Payback
27.72
PB
27.88
DPB
4,540.21
CpA
4.62
FMRR
3,489.92
Total
1,428.11
NPV
1,550.90
NFV
53.21
NUS
4.62
MIRR
6.15
IRR
Edit
Cash Flows
Value
NPV

TVM tab

Legend

Input Cells	Formula Cells	Description Cells

CCIM Financial Calculator-3/1/2017

Clear

Time Value of Money Calculations

Input	
YEARS	
P/YR	12
N	
I/YR	
PV	
PMT	
FV	
Beg 1/End 0	

EOP | $

0 PV =

1 PMT =

PMT = + FV =

I/YR =

N | I/YR | PV | PMT | FV

NPV-IRR tab

Legend		
Input Cells	Formula Cells	Description Cells

CCIM Financial Calculator-3/1/2017

Clear	NPV	IRR

Annual NPV and IRR Calculations

Holding Period (Years)	

EOY	Cash Flows	+	Sale Proceeds
0			

NPV Discount Rate	
Net Present Value	
Internal Rate of Return	