…This represents **Part 2** of a **4-part series** relative to the calculation of **Equity Cash Flow** (**ECF**) using **R**. If you missed **Part 1**, be certain read that first part before proceeding. The content builds off prior described information/data. **Part 1** previous post is located here. **'ECF – Method 2'** is defined as follows:

$$ECF_2 = FCFF - (\text{'After-tax' } CFd)$$

The equation appears innocent enough, though there are many underlying terms that require definition for understanding of the calculation. In words, '**ECF – Method 2'** equals free cash Flow (**FCFF**) minus after-tax Debt Cash Flow (**CFd**).

Reference details of the **5-year capital project's fully integrated financial statements developed in R** at the following link. The R output is formatted in Excel. Zoom for detail.

https://www.dropbox.com/s/lx3uz2mnei3obbb/financial_statements.pdf?dl=0
The first order of business is to define the terms necessary to calculate **FCFF.**

$$FCFF = Free\ Cash\ Flow$$

$$FCFF = NI + BD + \Delta DTL, net - Gain + SP - \Delta OWC - CapX + (IE)(1 - T) - (II)(1 - T)$$

$$NI = Net\ Income$$

$$Book = Book\ Depreciation$$

$$\Delta DTL, net = Change\ in\ Deferred\ Tax\ Liabiliites, net$$

$$Gain = Book\ Gain\ on\ Asset\ Sale$$

$$SP = Sales\ Proceeds\ from\ Asset\ Sale$$

$$OWC = Operating\ Working\ Capital = OCA - OCL$$

$$\Delta OWC = Change\ in\ Operating\ Working\ Capital$$

$$OCA = Operating\ Current\ Assets = Cash + A/R + INV + PE$$

$$Cash = Minimum\ level\ of\ cash\ required\ each\ period\ to\ adequately\ fund\ the\ operations\ of\ the\ the\ project$$

$$A/R = Accounts\ Receiveable$$

$$INV = Inventory$$

$$PE = Prepaid\ Expense$$

$$OCL = Operating\ Current\ Liabilities = +A/P + W/P + ITP$$

$$A/P = Accounts\ Payable$$

$$W/P = Wages(Salaries)\ Payable$$

$$ITP = Income\ Taxes\ Payable$$

Next, pretax Debt Cash Flow (CFd) and its components are defined as follows:

$$CFd = 'Pretax'\ Debt\ Cash\ Flow = IE - \Delta N$$

$$IE = Interest\ Expense\ (Pretax)$$

$$N = All\ interest\ bearing\ debt\ on\ the\ Balance\ Sheet$$

$$N = LTD + CPLTD + N/P$$

$$LTD = Long - term\ debt$$

$$CPLTD = Current\ portion\ of\ LTD$$

$$N/P = Notes\ Payable$$

$$\Delta N = Change\ in\ all\ Balance\ Sheet\ Debt$$

$$'After - tax'\ CFd = (IE)(1 - T) - \Delta N$$

The following data are added to the '**data**' tibble from the prior article relative to the financial statements.

```
data <- data %>%
  mutate(ie    = c(0, 10694, 8158, 527, 627, 717 ),
         np    = c(31415, 9188, 13875,  16500, 18863, 0),
         LTD   = c(250000, 184952, 0, 0, 0, 0),
         cpltd = c(0, 20550, 0, 0, 0, 0),
         ni    =  c(0, 47584,  141355,  262035, 325894, 511852),
         bd    =  c(0, 62500,  62500,   62500,   62500,   62500),
         chg_DTL_net = c(0, 35000,  55000,  35000, -25000, -100000),
         cash  = c(30500,  61250, 92500, 110000, 125750, 0),
         ar    = c(0, 61250,  92500,  110000,  125750, 0),
         inv   = c(30500, 61250, 92500, 110000,  125750, 0),
         pe    = c(915, 1838, 2775, 3300, 3773, 0),
         ap    = c(30500, 73500, 111000, 132000, 150900, 0),
         wp    = c(0, 5513, 8325, 9900, 11318, 0),
         itp   = c(0, -819.377,  9809,  34923, 60566, 0),
         CapX  = c(500000,0,0,0,0,0),
         gain  = c(0,0,0,0,0,162500),
         sp  = c(0,0,0,0,0,350000))
```

View tibble.

```
> rotate(data)
                [,1]       [,2]     [,3]     [,4]     [,5]      [,6]
Year            0.00      1.000      2.0      3.0      4.0       5.0
div             0.00   2379.000   7068.0  13102.0  16295.0 1249876.0
MS              0.00      0.000   7226.0 350948.0 698648.0       0.0
ii              0.00      0.000      0.0    253.0  12283.0   24453.0
pic        250000.00 250000.000 250000.0 250000.0 250000.0       0.0
T_              0.25      0.400      0.4      0.4      0.4       0.4
ie              0.00  10694.000   8158.0    527.0    627.0     717.0
np          31415.00   9188.000  13875.0  16500.0  18863.0       0.0
LTD        250000.00 184952.000      0.0      0.0      0.0       0.0
cpltd           0.00  20550.000      0.0      0.0      0.0       0.0
ni              0.00  47584.000 141355.0 262035.0 325894.0  511852.0
bd              0.00  62500.000  62500.0  62500.0  62500.0   62500.0
chg_DTL_net     0.00  35000.000  55000.0  35000.0 -25000.0 -100000.0
cash        30500.00  61250.000  92500.0 110000.0 125750.0       0.0
ar              0.00  61250.000  92500.0 110000.0 125750.0       0.0
inv         30500.00  61250.000  92500.0 110000.0 125750.0       0.0
pe            915.00   1838.000   2775.0   3300.0   3773.0       0.0
ap          30500.00  73500.000 111000.0 132000.0 150900.0       0.0
wp              0.00   5513.000   8325.0   9900.0  11318.0       0.0
itp             0.00   -819.377   9809.0  34923.0  60566.0       0.0
CapX       500000.00      0.000      0.0      0.0      0.0       0.0
gain            0.00      0.000      0.0      0.0      0.0  162500.0
sp              0.00      0.000      0.0      0.0      0.0  350000.0
```

All of the above calculations are defined in the below **R** function **ECF_2**. **'ECF – Method 2' R function**

```
ECF_2 <- function(a) {

  ECF2 <-      tibble(T_         = a$T_,
                      ie         = a$ie,
                      ii         = a$ii,
                      Year       = c(0:(length(ii)-1)),
                      ni         = a$ni,
                      bd         = a$bd,
                      chg_DTL_net = a$chg_DTL_net,
                      gain       = - a$gain,
                      sp         = a$sp,
                      ie_AT      = ie*(1-a$T_),
                      ii_AT      = - ii*(1-a$T_),
                      gcf        = ni + bd + chg_DTL_net + gain + sp
                                   + ie_AT + ii_AT,
                      OCA        = a$cash + a$ar + a$inv + a$pe,
                      OCL        = a$ap + a$wp + a$itp,
                      OWC        = OCA - OCL,
                      chg_OWC    = OWC - lag(OWC, default=0),
                      CapX       = - a$CapX,
                      FCFF1      = gcf + CapX - chg_OWC,
                      N          = a$LTD + a$cpltd + a$np,
                      chg_N      = N - lag(N, default=0),
                      CFd_AT     = ie*(1-T_) - chg_N,
                      ECF2       = FCFF1 - CFd_AT )


  ECF2 <- rotate(ECF2)
```

```
  return(ECF2)

}
```

Run the R function and view the output.

```
> ECF_method_2 <- ECF_2(data)
> ECF_method_2
                 [,1]       [,2]       [,3]     [,4]     [,5]      [,6]
T_               0.25      0.400       0.40      0.4      0.4       0.4
ie               0.00  10694.000    8158.00    527.0    627.0     717.0
ii               0.00      0.000       0.00    253.0  12283.0   24453.0
Year             0.00      1.000       2.00      3.0      4.0       5.0
ni               0.00  47584.000  141355.00 262035.0 325894.0  511852.0
bd               0.00  62500.000   62500.00  62500.0  62500.0   62500.0
chg_DTL_net      0.00  35000.000   55000.00  35000.0 -25000.0 -100000.0
gain             0.00      0.000       0.00      0.0      0.0 -162500.0
sp               0.00      0.000       0.00      0.0      0.0  350000.0
ie_AT            0.00   6416.400    4894.80    316.2    376.2     430.2
ii_AT            0.00      0.000       0.00   -151.8  -7369.8  -14671.8
gcf              0.00 151500.400  263749.80 359699.4 356400.4  647610.4
OCA          61915.00 185588.000  280275.00 333300.0 381023.0       0.0
OCL          30500.00  78193.623  129134.00 176823.0 222784.0       0.0
OWC          31415.00 107394.377  151141.00 156477.0 158239.0       0.0
chg_OWC      31415.00  75979.377   43746.62   5336.0   1762.0 -158239.0
CapX       -500000.00      0.000       0.00      0.0      0.0       0.0
FCFF1      -531415.00  75521.023  220003.18 354363.4 354638.4  805849.4
N           281415.00 214690.000   13875.00  16500.0  18863.0       0.0
chg_N       281415.00 -66725.000 -200815.00   2625.0   2363.0  -18863.0
CFd_AT     -281415.00  73141.400  205709.80  -2308.8  -1986.8   19293.2
ECF2       -250000.00   2379.623   14293.38 356672.2 356625.2  786556.2
```

R Output formatted in Excel Method 2

$$ECF_2 = FCFF - (IE)(1-T) + \Delta N = FCFF - (After\text{-}tax\ CFd)$$

Equity Cash Flow
ECF - Method 2

Year	0	1	2	3	4	5
FCFF	(531,415)	75,521	220,004	354,363	354,638	805,849
Less: Debt Cash Flow (After-tax)	281,415	(73,141)	(205,710)	2,309	1,986	(19,293)
Equity Cash Flow	(250,000)	2,380	14,294	356,672	356,624	786,556
ECF check	0	0	0	(0)	(0)	(0)

'**ECF Method 2**' agrees with the prior results from '**ECF Method 1**' each year. Any differences are due to rounding error.

This **ECF** calculation example is taken from my newly published textbook, '**Advanced Discounted Cash Flow (DCF) Valuation using R**.' It is discussed in far greater detail along with development of the integrated financials using **R** as well as numerous, advanced **DCF** valuation modeling approaches – some never before published. The text importantly clearly explains '**why'** these **ECF** calculation methods are **mathematically exactly equivalent**, though the individual components appear vastly different.

Reference my website for further details.