

...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:

$$ECF_2 = FCFF - ('After - tax' CFd)$$

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

$$FCFF = NI + BD + \Delta DTL_{net} - Gain + SP - \Delta OWC - CapX + (IE)(1 - T) - (ITP)(1 - T)$$

NI = Net Income

Book = Book Depreciation

ΔDTL_{net} = Change in Deferred Tax Liabilities, net

Gain = Book Gain on Asset Sale

SP = Sales Proceeds from Asset Sale

OWC = Operating Working Capital = OCA – OCL

ΔOWC = 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 Receivable

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:

$CF_d = \text{'Pretax' Debt Cash Flow} = IE - \Delta N$

$IE = \text{Interest Expense (Pretax)}$

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

$N = LTD + CPLTD + N/P$

$LTD = \text{Long - term debt}$

$CPLTD = \text{Current portion of LTD}$

$N/P = \text{Notes Payable}$

$\Delta N = \text{Change in all Balance Sheet Debt}$

$\text{'After - tax' } CF_d = (IE)(1 - T) - \Delta N$

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

$$ECF_2 = FCFF - (IE)(1 - T) + \Delta N = FCFF - (Ater - tax CFd)$$

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.