

...Over the next several days, I will present **4 different methods** of correctly calculating **Equity Cash Flow (ECF)** using **R**. The valuation technique of discounted cash flow (**DCF**) estimates equity value (**E**) as the present value of forecasted **ECF**. The appropriate discount rate for this flow definition is the cost of equity capital (**Ke**).

'**ECF – Method 1**' is defined as follows:

$$ECF_1 = DIV - \Delta PIC + \Delta MS - (II)(1 - T)$$

where

ECF₁ = Equity Cash Flow for 'Method 1'

DIV = Dividends

ΔPIC = Change in 'Paid – in – Capital'

ΔMS = Change in 'Marketable Securities'

II = Interest Income

T = Composite Tax Rate

Note: **ECF** is not simply 'dividends.' A common misconception is that discounted dividends (**DIV**) provide equity value. An example of this is the common 'dividend growth' equity valuation model found in many corporate finance texts. All 'dividend growth' models that discount dividends (**DIV**) at the cost of equity capital (**Ke**) are incorrect unless forecasted **1)** marketable securities (**MS**) balances are zero, and **2)** there is no **issuance** or **repurchase** of equity shares.

The data assumes a **5-year year** hypothetical **capital project**. A single **revenue producing asset** is purchased at the end of '**Year 0**' and is sold at the end of '**Year 5**.' The **\$500,000** asset is purchased assuming **50% debt** and **50% equity** financing.

Further, the data used to estimate **ECF** in this example are taken from **fully integrated pro forma financial statements** and other relevant data assumptions including the corporate tax rate. This particular example only requires financial data from integrated **pro forma income statements** and **balance sheets**. These 2 pro forma financial statements are shown below with the relevant data rows highlighted.

5-Year Capital Investment Analysis Fully Integrated Financials Using R

Year	0	1	2	3	4	5
Revenue	0	618,000	1,113,000	1,898,000	2,200,000	2,113,000
Cost of sales	0	180,000	315,000	1,079,000	1,216,000	1,046,000
Gross Margin	0	248,000	498,000	777,000	824,000	1,136,000
SG&A	0	30,000	180,750	177,500	180,000	177,250
R&D	0	110,000	240,250	400,100	390,000	320,300
Depreciation	0	50,000	50,000	63,500	61,500	50,000
EBIT	0	88,000	138,750	687,000	611,500	668,450
Interest Expense	0	18,000	8,318	127	627	717
Income before taxes	0	0	0	711	12,283	14,433
Taxes (expense)	0	0	0	0	0	160,300
Pre-tax Income	0	79,908	135,992	406,126	543,156	613,086
Effective income taxes	0	36,000	15,000	70,000	81,000	100,000
Current Income Taxes	0	32,700	10,217	130,000	242,283	460,234
Book Taxes	0	35,712	94,237	174,000	217,283	340,234
Net Income	0	43,908	141,015	262,055	311,873	511,812
Cash	250,000	65,239	92,300	120,000	133,700	0
Intangible assets	0	0	7,115	100,000	400,000	0
Accounts receivable	0	65,239	92,300	120,000	133,700	0
Inventory	10,000	60,239	92,300	110,000	123,700	0
Prepaid Expenses	0	0	0	0	0	0
Current assets	65,115	185,589	287,015	340,000	1,819,670	0
PP&E	250,000	250,000	250,000	250,000	250,000	0
Acc. Depreciation	0	10,000	110,000	187,500	250,000	0
PP&E, net	250,000	240,000	140,000	62,500	0	0
Assets	315,115	425,589	427,015	402,500	1,819,670	0
Accounts payable	10,000	70,000	110,000	120,000	100,000	0
Wages payable	0	5,115	8,315	9,999	11,200	0
Income taxes payable (pre-taxable)	0	8,115	8,000	94,000	60,000	0
Long-term debt, current portion	0	10,000	0	0	0	0
Notes payable	11,415	9,180	13,815	16,500	10,000	0
Current liabilities	65,115	103,310	140,000	140,500	181,200	0
Long-term debt	240,000	240,000	0	0	0	0
Deferred tax liabilities, net	0	10,000	10,000	120,000	100,000	0
Liabilities	245,115	353,310	150,000	260,500	281,200	0
Preferred capital	210,000	210,000	210,000	210,000	210,000	0
Retained earnings, prior period	0	0	40,000	170,000	410,000	710,000
Net Income	0	43,908	141,015	262,055	311,873	511,812
Dividends	0	0	0	0	0	0
Retained earnings, current period	0	43,908	179,492	432,055	721,873	0
Equity	210,000	253,908	429,492	674,055	1,131,873	1,221,812
Liabilities and Equity	455,115	609,218	569,492	674,555	1,819,670	1,221,812
Balance sheet check	0	0	0	0	0	0

<https://www.dropbox.com/s/xwy97flxe99gqr9/financials.pdf?dl=0>

The above link provides access to a **PDF** of all financial statement pro forma data and is easily zoomable for viewing purposes.

The relevant data used to calculate **ECF** are initially placed in a tibble.

```
library(tidyverse)
```

```
data <- tibble(Year = c(0:5),
               div = c(0, 2379, 7068, 13102, 16295, 1249876),
               MS = c(0, 0, 7226, 350948, 698648, 0),
               ii = c(0, 0, 0, 253, 12283, 24453),
               pic = c(250000, 250000, 250000, 250000, 250000, 0),
               T_ = c(0.25, 0.40, 0.40, 0.40, 0.40, 0.40))
```

```
data
```

```
> data
# A tibble: 6 x 6
  Year    div    MS    ii    pic    T_
<int> <dbl> <dbl> <dbl> <dbl> <dbl>
1     0     0     0     0 250000 0.25
2     1  2379     0     0 250000 0.4
3     2  7068  7226     0 250000 0.4
4     3 13102 350948  253 250000 0.4
5     4 16295 698648 12283 250000 0.4
6     5 1249876 0 24453     0 0.4
```

An **R** function is created to rotate the data in standard financial data presentation format (each

data line item occupies a single row instead of a column)

```
rotate <- function(r) {

  p <- t(as.matrix(as_tibble(r)))

  return(p)

}
```

View the rotated data.

```
rotate(data)
```

```
> rotate(data)
```

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]
Year	0.00	1.0	2.0	3.0	4.0	5.0
div	0.00	2379.0	7068.0	13102.0	16295.0	1249876.0
MS	0.00	0.0	7226.0	350948.0	698648.0	0.0
ii	0.00	0.0	0.0	253.0	12283.0	24453.0
pic	250000.00	250000.0	250000.0	250000.0	250000.0	0.0
T_	0.25	0.4	0.4	0.4	0.4	0.4

An **R** function reads in the appropriate data, performs the necessary calculations, and outputs the data. The **R** output is then placed in a spreadsheet to formatting purposes.

‘ECF – Method 1’ R function

```
ECF_1 <- function(a) {

  ECF1 <-      tibble( T_          = a$T_,
                      pic         = a$pic,
                      chg_pic     = pic - lag(pic, default=0),
                      MS          = a$MS,
                      ii          = a$ii,
                      Year        = c(0:(length(T_)-1)),
                      div         = a$div,
                      net_new_equity = -chg_pic,
                      chg_MS      = MS - lag(MS, default=0),
                      ii_AT       = -ii*(1-T_),
                      ECF1        = div + net_new_equity
                                + chg_MS + ii_AT )

  ECF1 <- rotate(ECF1)

  return(ECF1)

}
```

View R Output

```
ECF_method_1 <- ECF_1( data)
ECF_method_1
```

```
> ECF_method_1
```

	[,1]	[,2]	[,3]	[,4]	[,5]	[,6]
T_	0.25	0.4	0.4	0.4	0.4	0.4
pic	250000.00	250000.0	250000.0	250000.0	250000.0	0.0
chg_pic	250000.00	0.0	0.0	0.0	0.0	-250000.0
MS	0.00	0.0	7226.0	350948.0	698648.0	0.0
ii	0.00	0.0	0.0	253.0	12283.0	24453.0
Year	0.00	1.0	2.0	3.0	4.0	5.0
div	0.00	2379.0	7068.0	13102.0	16295.0	1249876.0
net_new_equity	-250000.00	0.0	0.0	0.0	0.0	250000.0
chg_MS	0.00	0.0	7226.0	343722.0	347700.0	-698648.0
ii_AT	0.00	0.0	0.0	-151.8	-7369.8	-14671.8
ECF1	-250000.00	2379.0	14294.0	356672.2	356625.2	786556.2

Excel formatting applied to R Output

$$ECF_1 = DIV - \Delta PIC + \Delta MS - II(1 - T)$$

Equity Cash Flow
ECF - Method 1

	Year	0	1	2	3	4	5
Dividends		0	2,379	7,068	13,102	16,295	1,249,876
Less: Net New Equity		(250,000)	0	0	0	0	250,000
Plus: Increase in Marketable Securities		0	0	7,226	343,722	347,700	(698,648)
Less: Interest Income (After-tax)		0	0	0	(152)	(7,370)	(14,672)
Equity Cash Flow		(250,000)	2,379	14,294	356,672	356,624	786,557

It is quite evident there is far more than just dividends (**DIV**) involved in the proper calculation of **ECF**. Use of a '**dividend growth**' equity valuation model in this instance would result in **significant model 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.