

...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	115,000	1,115,000	1,894,000	1,200,000	2,115,000
Cost of sales	0	180,000	710,000	1,070,000	1,210,000	1,840,000
Gross Margin	0	244,000	400,000	777,000	814,000	1,130,000
SG&A	0	30,000	180,750	177,500	180,000	177,250
R&D	0	150,000	240,250	600,100	590,000	120,750
Depreciation	0	10,000	50,000	60,500	61,500	60,000
EBIT	0	86,000	130,750	107,000	111,500	169,850
Interest Expense	0	18,000	8,334	0	127	717
Income before taxes	0	0	0	107,000	111,373	169,133
Taxes (Current)	0	0	0	0	0	100,700
Pre-tax Income	0	19,000	135,000	107,000	111,373	68,433
Income before taxes	0	19,000	135,000	107,000	111,373	68,433
Current Income Taxes	0	31,700	10,217	100,000	202,201	400,234
Book Taxes	0	10,711	34,287	174,000	211,201	810,548
Net Income	0	67,300	145,415	162,000	111,894	111,812
Cash	10,000	61,779	92,709	120,000	113,700	0
Accounts receivable	0	0	7,140	100,000	400,000	0
Accounts payable	0	60,230	92,000	100,000	113,700	0
Inventory	10,000	60,230	92,000	100,000	113,700	0
Prepaid Expenses	0	0	0	0	0	0
Current assets	10,000	118,009	191,709	200,000	227,400	0
PP&E	100,000	100,000	100,000	100,000	100,000	0
Acc. Depreciation	0	10,000	110,000	180,000	240,000	0
PP&E, net	100,000	90,000	100,000	100,000	100,000	0
Plant	100,000	90,000	100,000	100,000	100,000	0
Accounts payable	10,000	170,000	110,000	100,000	100,000	0
Notes payable	0	0	0	0	0	0
Income taxes payable (prepaid)	0	0	0	0	0	0
Long-term debt, current portion	0	0	0	0	0	0
Notes payable	10,000	10,000	10,000	10,000	10,000	0
Current liabilities	10,000	10,000	10,000	10,000	10,000	0
Long-term debt	10,000	10,000	10,000	10,000	10,000	0
Deferred tax liabilities, net	0	0	0	0	0	0
Liabilities	10,000	10,000	10,000	10,000	10,000	0
Preferred capital	10,000	10,000	10,000	10,000	10,000	0
Retained earnings, prior period	0	0	0	0	0	0
Net Income	0	67,300	145,415	162,000	111,894	111,812
Dividends	0	0	0	0	0	0
Retained earnings, current period	0	67,300	145,415	162,000	111,894	111,812
Equity	10,000	177,300	290,815	324,000	223,894	223,624
Liabilities and Equity	10,000	187,300	300,815	334,000	233,894	234,636
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.