

Using VBA and Excel to Create Valuation Functions

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ABSTRACT

We use an exercise in the Graduate MBA Finance course to develop VBA skills. There are financial valuations that are not found in Excel: particularly a growing annuity, a perpetuity, and a growing perpetuity. The use of VBA helps to understand the components and mathematical operations to solve the valuations, their component parts, or both. We create assignments with an algorithm to limit unoriginal work. The students are successful with using VBA and can use their created functions throughout the remainder of the course.

INTRODUCTION

The value of a dividend paying stock can be valued by discounting a firm's expected future dividends. The impetus of valuation theory comes from the firm's motive in modern finance to maximize shareholder wealth. The MBA curriculum at Our Lady of the Lake University, OLLU, includes a corporate finance course. Our coverage of investment returns assumes optimizing. We take that as trading to buy low and sell high, investing in projects to have positive net present value, and comparing intrinsic value to actual value. The MBA program outcomes for finance are

1. Evaluate investment projects and firm value.
2. Evaluate capital structure and cost of capital decisions.
3. Evaluate dividend and stock repurchase decisions.
4. Assess the risk within a global context and situation.

The corporate finance course outcomes include

1. Create and use a financial calculator or spreadsheet to solve time value of money problems.
2. Analyze how stock prices depend on expected dividends and dividend growth.
3. Analyze and compute stock value using the dividend growth model.

We created an assignment to address the valuation of firms using the dividend growth model (Gordon growth model). Here we discuss the information presented to the students, the VBA assignment, and the Valuation assignment. We use financial models and Excel spreadsheets to engage the students. “The only way you can learn to develop good financial models is by practicing a lot” (Sengupta, 2010).

THE MODEL

In the class room presentation, we show that a sum in the future will be discounted at $1/(1 + k_t)^t$. The pattern of a stream becomes a Taylor series that enables one to find a pattern for the growing annuity. For the proficient mathematical students, a tangent challenge is to derive the formula. A perpetuity would be a stream that is infinite. Gordon developed the growing annuity commonly called the dividend discount model, or Gordon Growth Model, GGM, (Gordon, 1962). The model is

$$S_t = \frac{D_{t+1}}{k_s - g}$$

Where S is the discounted stock price in period t , D is the dividend in period $t+1$, k is the cost of (return on) the stock, and g is the growth rate of the dividend stream. But his model was based on the discounting the dividends at

$$k - br$$

where k is the rate at which future dividends are discounted, and r is the average rate of return on expected retained income. Gordon did discuss the issue of k not being greater than br (Gordon, 1962).

We encourage a literature search by the students. Those we chose to use in class, address the model relative to how others estimated it, the components, and time dynamics. We precede this assignment with an assignment on forensically creating the income statements and balance sheet from 20 account items for two periods. The use of financial accounting statements via S&P Net Advantage are available to us as an example. We strongly link the use of accounting data and financial modeling (Fink, 2003).

Taggart uses Excel spreadsheets with models that use formulas. He uses the sustainable growth rate and necessitates the use of financial statements to assess value (Taggart, 1999). In keeping with Ockham’s razor, we use the simple dividend growth model, but discuss other functional forms. This is suggested in Macklemore. “Reducing the number of dividends and the horizon date in the model reduces prediction error. Prediction error is also reduced by using time-varying equity discount rates when market volatility increases” (McLemore, 2015).

Forester and Sapp find that over the long run (120 years) their study firm's valuation derived from dividends was used to predict actual prices. The t-tests of differences in actual prices and GGM estimates did not show a statistical difference (Foerster, 2005).

In addition, the current state of repurchases of stock affects the valuation according to Lamdin. The value is

$$\frac{[(D_t + R_t)(1 + g)]}{(r - g)}$$

Where D is the dividends, R is the repurchase amount, and S is the Share outstanding at time t . The required return to shareholders is r and the growth rate of dividends and repurchases is g (Lamdin, 2000).

THE VBA ASSIGNMENT

The purpose is to understand how the components of the dividend discount model interact to value stock, determine the growth rate, or the value of the current dividend. We have students create Excel spreadsheet models with Visual Basic created functions. As Bowen suggests with engagement, to “improve learning, we must force students into more substantive interaction with material outside of class” (Bowen, 2012).

The assignment has steps to pace the students through the creation of the VBA code. See Appendix 1. OLLU uses Office 365, and we give instructions for EXCEL 2016. We address the nuances for Apple IOS in class. In class, the model is started to the point of creating notes in the VBA model. The students are encouraged to describe what the function does, place their name(s) and date. They are directed to show the “Developer” tab in EXCEL.

The steps are to

1. Create a spreadsheet.
2. Create a function
3. Get to the VBA editor
4. Add a module
5. Type the code for the formula
6. Go back to the Excel file
7. Test the function

The macro enabled file (.xlsm extension) is submitted. We additionally add an assignment for the students to use their formulas.

THE TIME VALUE OF MONEY ASSIGNMENTS

The purpose of this assignment is to compute the stock value, the required rate of return, and the growth rate of the GGM. The creation of the assignment is done within in a spreadsheet, see Figure 1. The second, fourth, and sixth columns are formatted cells created with the

“randbetween” function. This function produces a random number between a range (top and bottom numbers, respectively).

It is adjusted to produce desired decimal places, e.g. dividends with two decimal places.

Figure 1. Concatenation Set-up.

S1. Stock. What is the value of a stock with a				
a.	3.25	dividend just paid and a	10	% required return with 0 % growth
b.	2.25	dividend just paid and a	7	% required return with 1 % growth
c.	0.25	dividend just paid and a	9	% required return with 2 % growth
d.	3.25	dividend just paid and a	12	% required return with 3 % growth
S2. Stock. What is the required rate of return on a stock with a				
a.	0.50	expected dividend and a	17.00	price with 7 % growth
b.	1.25	expected dividend and a	18.00	price with 8 % growth
c.	2.50	expected dividend and a	34.00	price with 9 % growth
d.	4.25	expected dividend and a	15.00	price with 10 % growth
S3. Stock. What is the growth rate of the stock with a				
a.	2.50	expected dividend and a	17.00	price with 15 % required return
b.	2.00	expected dividend and a	33.00	price with 12 % required return
c.	3.00	expected dividend and a	30.00	price with 11 % required return
d.	1.77	expected dividend and a	27.00	price with 14 % required return

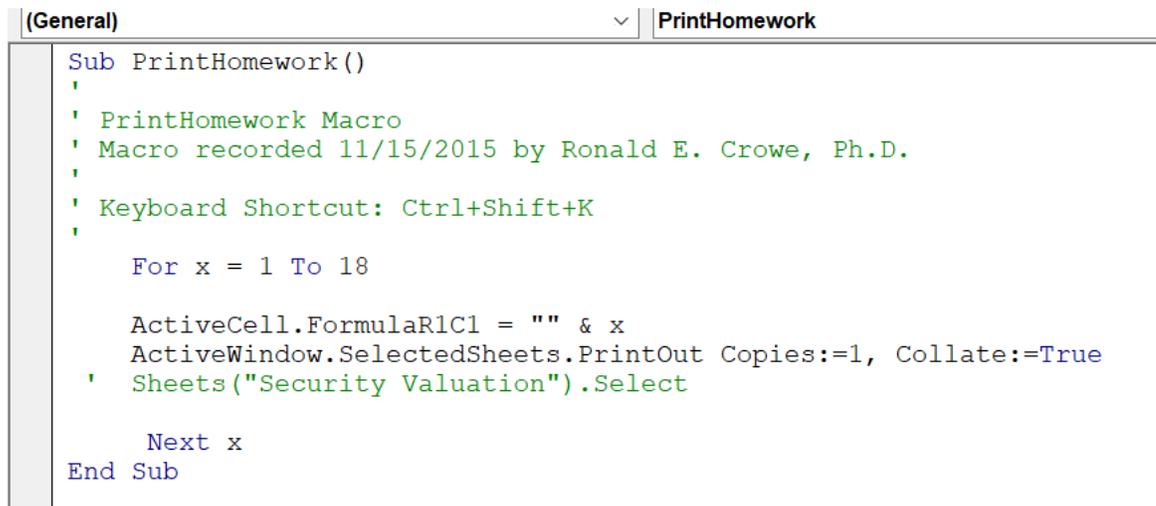
The final version is created with the “concatenate” function. This function will produce the assignment questions in a cell, see Figure 2. In the third column, we generate answers to the questions. This allows students to check their work. On the submitted homework file, we check the VBA module for errors, the correct format of the answers, and the accuracy of their function answers.

Figure 2. Concatenation output.

	Answers	Class 4/ Set #18 # 18
S1. Stock. What is the value of a stock with a		
a. \$0.25 dividend just paid and a 12 % required return with 0 % growth?	a.	2.08
b. \$1.25 dividend just paid and a 6 % required return with 1 % growth?	b.	25.25
c. \$2.25 dividend just paid and a 10 % required return with 2 % growth?	c.	28.69
d. \$0.25 dividend just paid and a 12 % required return with 3 % growth?	d.	2.86
S2. Stock. What is the required rate of return on a stock with a		
a. \$3.5 expected dividend and a 30 price with 7 % growth?	a.	18.67
b. \$1.25 expected dividend and a 15 price with 8 % growth?	b.	16.33
c. \$0.5 expected dividend and a 28 price with 9 % growth?	c.	10.79
d. \$0.25 expected dividend and a 40 price with 10 % growth?	d.	10.63
S3. Stock. What is the growth rate of the stock with a		
a. \$2.5 expected dividend and a 40 price with 15 % required return?	a.	8.75
b. \$2 expected dividend and a 19 price with 12 % required return?	b.	1.47
c. \$3 expected dividend and a 22 price with 11 % required return?	c.	-2.64
d. \$1.77 expected dividend and a 40 price with 14 % required return?	d.	9.58

The individualization of the assignment (one per student) is done with the code below. Each time the code changes the “x”, the randbetween function will generate different answers. This code prints out the output for the number of copies desired, i.e. 18 in this example. The code can be amended to produce spreadsheet files.

Figure 3. VBA Print Code



```
Sub PrintHomework()  
'  
' PrintHomework Macro  
' Macro recorded 11/15/2015 by Ronald E. Crowe, Ph.D.  
'  
' Keyboard Shortcut: Ctrl+Shift+K  
'  
    For x = 1 To 18  
  
        ActiveCell.FormulaR1C1 = "" & x  
        ActiveWindow.SelectedSheets.PrintOut Copies:=1, Collate:=True  
'    Sheets("Security Valuation").Select  
  
    Next x  
End Sub
```

CONCLUSION

After assigning, we noticed several things. Some students would try to use just letters for variables in their formulas. Others would use variable names that were Excel functions, i.e. “RATE” and “INTRATE.” Those students with limited Excel experiences needed help on formatting the answers.

In classes some sections, we experimented with work in teams. This reduced the number of assignments to grade. Some teams worked together. Some students complained that no one helped them. We have added a peer evaluation to address this issue.

Appendix I. VBA Assignment

Task one. Create an Excel function for three formulas.

You will create functions for the following: Dividend Discount model, DDM, price, DDM growth rate, and DDM current dividend.

Step one. Create a spreadsheet. Give it a name (save it to the Desktop)

Step two. Create a function using the Macro feature in Excel. (Hint: follow steps below, but write out function on paper before you do it in excel.

Step three. On the **Data tab** (make it visible via “options - customize ribbon – check the developer tabs on the right where it says Main Tabs”, and then click **Visual Basic Editor**

Step four. On the **insert** menu in the **Microsoft Visual Basic** window, click **module**.

Step five. In the module window, type the code for your function.

The first line is the **Function** command and then the **function name** and **arguments**.

The next lines will define the math (note the spaces). The last line is the **End Function** command

For Example. The holding period return is the income plus the capital gain or loss, all divided by the purchase price of the asset. A function example follows.

Places this information preceded by a semicolon (;) . This is for notes and will not affect the function.

```
; This function calculates the holding period return, hpreturn, income for income,  
; capitalgain for capital gain or loss, and purchaseprice for purchase price.
```

Below the information code your functions. You must use **eight (8) to 12 characters** for the name and components of your function and the components. Avoid using just letters.

```
Function hpreturn(income, capitalgain, purchaseprice)  
hpreturn = ( income + capitalgain) / purchaseprice  
End Function
```

The above concludes the sample. Show your code work.

Step six. Once you have your code completed, on the **file** menu, click **Close and Return to Excel**. Do this each time for each function formula.

Step seven. Save the file via “Save As” and name the file “FINC8329 Team Name DD MMM YY”. The file type should be “Excel Macro-Enabled Workbook (*.xlsm)”.

Step seven. In your spreadsheet, test the functions with the data from the time value of money assignment.

Task two. Submit your spreadsheet.

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