

Excel 4 Financial Functions and Amortization Schedules

Objectives (ref. EX 209)

- Assign a name to a cell or range and use the name in a formula
- Use the financial functions PV, FV, and PMT to solve business problems
- Create an amortization schedule
- Analyzing data with Excel data table tool and add a pointer to a data table
- Use names and print sections of a worksheet
- Protect and unprotect cells in a worksheet
- Hide and unhide cell gridlines, rows, columns, sheets, and workbooks
- Use formula checking features

I. *Planning Ahead*

- **The project**—ref. page EX 211, Fig. 4-1
- **Tasks and Challenges**—ref. EX 213 Roadmap
- **Download the example file from the course schedule page**

II. *PV and FV Concepts and Excel Functions*

Future Values

- Future Value of a cash amount today OR a series of amounts with each occurring at a regular time interval
- FV(rate, nper, pmt, pv, type)
 - rate—the interest rate per period.
 - nper—the total number of payment periods considered.
 - pmt—the fixed amount occurred each period.
 - pv—the present value, the amount occurred at the very beginning. At least one of the pmt and pv must present in the function.
 - type—the timing of the cash flow.
 - 0: cash flow occurs at the end of each period, which is the default;
 - 1: cash flow occurs at the beginning of each period.
 - Excel assumes that cash outflow is negative and cash inflow is positive.

Examples

1. fv(3%, 10, 0, 1000,0)—produces the value at the end of 10th year for \$1,000 today under an annual interest rate of 3%;
2. fv(3%, 10, 1000, 0, 0)—produces the value at the end of 10th year for a series of cash amounts of \$1,000 occurring at the end of each year for 10 years, under an annual interest rate of 3%.

Present Values

- Today's value of a future amount OR a series of future amounts with each occurring at a regular time interval
- PV(rate, nper, pmt, fv, type)
 - All parameters are the same as in FV() except for fv, which is the cash balance at the end of the total periods.

Examples

1. pv(3%, 10, 0, 1000, 0)—produces today's value for an amount of \$1,000 occurring at the end of 10th year under an annual interest rate of 3%;

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2. $pV(3\%, 10, 1000, 0, 0)$ —produces today’s value for a series of cash amounts of \$1,000 occurring at the end of each year for 10 years, under an annual interest rate of 3%

Other Financial Functions

- Click on Insert Function button  | Financial Category | Select a function | Help on this function

III. Loan Calculator

Entering Basic Loan Data and Formatting the Range

- Look at the example worksheet to exam its structure and determine what are the basic data
- Choose Frame theme and bold face the whole worksheet
- Enter the text for C4:C8 and E4:E8
- Enter the system date at D4 and format the worksheet as required

Creating Range Names Based on Row Titles

Select the Data range | Formulas tab on Ribbon | Create from Selection button | ...

Entering Formulas and Using Range Names

Monthly Payment	=	$-PMT(\text{Rate} / 12, 12 * \text{Years}, \text{Loan_Amount})$
Total Interest	=	$12 * \text{Years} * \text{Monthly_Payment} - \text{Loan_Amount}$
Total Cost	=	$\text{Price} + \text{Total_Interest}$

IV. Using a Data Table to Analyze Worksheet Data

Data Table

It’s an area used to store what-if analysis result. Excel supports two types of data tables—one input/variable and two inputs/variables.

Creating the Payment Data Table

1. Enter the following
 - the column titles
 - a series of interest rates starting from C12 down
 - formulas (or addresses that have the formulas) for the payment data table—across starting from the cell that is one row above and one column to the right of the interest rate series (D11 in the example)
2. Define the payment data table—Select the rectangle range including the interest rate series and the formulas | Data tab on Ribbon | What-If Analysis | Data Table ...
3. In the data table dialog box, enter F4 in the column input field and leave the row input field empty. Why? Because the data table in the example uses one input/variable, the interest rate (F4), that takes the values of the interest rate series arranged in a column.

Adding a Pointer to the Data Table

- We would like to highlight the cell in the interest rate column that matches the interest rate used for calculating payments in the Loan Payment Calculator. How?
- Select all values in the interest rate column | Home tab on Ribbon | Conditional Formatting | Highlight Cell Rules | Equal to | Click on the interest rate cell Or enter the cell’s absolute address

Analyzing Relationships between Two Data Series

- What chart types have we used so far?

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- Can we use a simple line chart or column chart to display the relationship between interest rate and monthly payment?
- Often you may find that the scatter chart (also called X-Y chart) does a better job.

Creating a Two-Input Data Table

Reference: <http://office.microsoft.com/en-us/excel-help/calculate-multiple-results-by-using-a-data-table-HP010342214.aspx>
<http://office.microsoft.com/en-us/excel-help/calculate-multiple-results-by-using-a-data-table-HA102749053.aspx?CTT=1>

- How to assess the impact of interest rate and the mortgage amortization term on monthly payment?
- Procedure
 1. Create an interest rate series in a column and a year series in a row so that they make a rectangle area but leave the upper left corner empty.
 2. In the upper left corner of the rectangle range, put the monthly payment formula or the address of the cell that has the formula.
 3. Define the payment data table—Select the rectangle range including the interest rate series and the year series | Data tab | What-If Analysis | Data Table | row input: the year cell address used in the formula; column input: the interest rate cell address used in the formula.

V. Creating an Amortization Schedule

Preparation

- Enter the column titles and the year series then format the schedule

Determining the Formulas

- Year 1 beginning balance is the Loan Amount, which is also equivalent to the PV of the pay series of the whole amortization schedule
- Year 1 Ending Balance = the PV of the payment series over the remaining periods until maturity
- Year 1 Paid On Principal = Beginning Balance – Ending Balance
- Year 1 Interest Paid = annual payment – Paid On Principal
- Year 2 Beginning Balance = Year 1 Ending Balance
- Fill the Year 2 row and then the whole table by coping / pasting the formulas
- Complete the total section and format the schedule properly

Question

- How to make the schedule more flexible so that it still display correct result even if the formulas are copied to years beyond the amortization time scope?
- Use IF() to the formulas in Ending Balance and Interest Paid columns

VI. Printing Sections of the Worksheet

Setting up a worksheet to print

Page Layout tab | Page Setup Dialog Box Launcher | set up various options

Setting up and selecting the print area

- Setting a printing area—Select the range | Page Layout tab | Print Area | Set Print Area
- When you print the worksheet, the preset print area will be printed

Using range names for printing

- Set the range name—Select the range | Enter the name in Name Box
- Print using a range name—Select the range name in Name Box | In the Print dialog window choose Selection

VII. *Protecting and Hiding Worksheet /Workbook*

Protecting a Worksheet

- Every cell has a locked option, which is checked by default. However, that is not enough to lock or protect the cell. To lock a cell, not only the cell's locked option must be checked but also the worksheet protected.
- To keep some cells unprotected, select and unlock the cells, then protect the whole worksheet.
- To unlock cells—Select cells | R-Click on the selection | Format Cells | Protection | uncheck Locked option
- To protect the worksheet—Review tab on Ribbon | Protect Sheet
- You may also set a password so that a password must be provided in order to change the worksheet protection status. DON NOT use this feature on your assignment!!!!

Hiding and Unhiding Gridlines

- View Tab | Check or uncheck Gridlines

Hiding and Unhiding Columns/Rows

- Hide: R-click on the column (or row) heading then choose hide in the popup menu
- Unhide a column: Select the column headings on both left and right sides of the hidden column, R-click on the selected columns, then choose unhide.
- Unhide a row: Select the row headings above and below the hidden row, R-click on the selected rows, then choose unhide.

Hiding and Unhiding a Sheet

- Why hide a worksheet?
- How to do it? R-Click on a worksheet tab at the bottom of the worksheet | Hide/Unhide

Protecting a Workbook

- You may protect a workbook from structural changes such as adding/deleting a sheet
 - How to do it? Review Tab | Protect Workbook button | Protect Structure
- NOTE: Excel 2013 has removed Protect Windows option. It's still there but is grayed out

Hiding and Unhiding a Workbook

Why hide a workbook? Reduce the number of visible applications or avoiding data tampering when the machine is unattended

- Hide the current workbook: View tab on Ribbon | Hide button in Window group
- Unhide: View tab on Ribbon | Unhide button in Window group | Choose a workbook to unhide

VIII. *Formula Checking*

Excel can check formulas for irregularity, just like spell checker for misspelled words.

Manual Checking Formulas

Formulas tab on Ribbon | Error Checking command in Formula Auditing group

Enabling Background Formula Checking

By default, Excel does the background formula error checking. However, if not, you can enable it following this procedure:

File tab | Options | Formulas | Check "Enable background error checking" in Error checking Section.