Excerpt from
***Introduction to Real Estate Finance and Investment: Sample Problems, Student Edition*, by Frank Gallinelli**

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Chapter 4: Present Value of a Future Cash Flow

You can think of calculating Present Value (PV) as the reverse of the compound interest process. With compound interest you know the Present Value (i.e., the starting amount) and you know the periodic interest rate; you are trying to find what you would end up with – the Future Value (FV).

With this new calculation you still know the periodic rate but now you know the FV and want to figure out the PV instead.

As an investor, you have a very specific reason for wanting to make this calculation. Most investment returns, especially with real estate, do not arrive instantly. You may have to wait several years until you sell a property and realize a return. The longer you have to wait for a return, the less valuable it is because during that period of waiting you did not have the return in hand to put to work elsewhere. Money received in the future is less valuable than money received today. Hence, you use discounting to find the present worth (the PV) of a future return (the FV).

> **Present Value = Future Value / [(1 + *i*) ^{n}],** where *i* is the periodic discount rate and n is the number of periods

The formula can be cumbersome to use, but there are other ways you can make this calculation. One method is to use a table of Annual Present Value Factors, which we provide at http://www.realdata.com/book. If you use the table, your formula works as follows:

> **Present Value = Factor from Table x Future Value**

Another way to get your answer is to use Microsoft Excel's built-in function, PV. The function looks like this:

> **=PV(rate,nper,pmt,fv,type)**.

Rate is the interest rate per period; **nper** is the number of periods; **pmt** is the amount of periodic payments, which we will not use here; **fv** is the Future Value; and **type** designates whether payments are made at the beginning or the end of periods. You don't need to use this last item, because the default is what you want here: end-of-period.

You will see both the PV table and the Excel methods demonstrated below.

Problem 4-1:

A friend promises to pay you $7,000 four years from today. You figure that if he paid you the money today you could invest it at 3%. What is the value today of this promised $7,000?

Problem 4-2:

You are thinking about buying a property that will yield $85,000 cash proceeds upon sale ten years from today, but no income before then. You believe that alternative investment opportunities would give you 4.5% per year return on your money. What is the greatest amount of cash you would be willing to commit to this investment?

Answer 4-1:

Solve this problem first by using the table of Present Value Factors located at http://www.realdata.com/book. You'll find the table among the pdf files there.

Locate the factor you need. The problem says you must discount at 3% per year for four years. From the following snippet of the table, you locate the intersection of those two variables and find the factor you need: 0.888487

Annual Present Value Factors

Years	3.000%	3.125%	3.250%	3.375%	3.500%	3.625%	3.750%
1	0.970874	0.969697	0.968523	0.967352	0.966184	0.965018	0.963855
2	0.942596	0.940312	0.938037	0.935770	0.933511	0.931260	0.929017
3	0.915142	0.911818	0.908510	0.905219	0.901943	0.898683	0.895438
4	0.888487	0.884187	0.879913	0.875665	0.871442	0.867245	0.863073

Now apply the formula:

Present Value = Factor from Table x Future Value

Present Value = 0.888487 x 7,000

Present Value = 6219.41

Let's solve the same problem using Excel. Recall that the PV function looks like this:

=PV(rate,nper,pmt,fv,type)

Also recall that you do not need to specify "pmt" or "type." In fact, you never need to make an entry for "type" unless you are receiving beginning-of-period payments, as with a lease. Hence, the formula you enter in Excel is

=PV(0.03,4,,7000)

and Excel returns (6219.41) as the answer. Note that Excel displays the answer as a negative number, which may be a bit confusing. Remember that discounting is a variation of compound interest. Technically, this is the correct way to express what is happening. To put it literally, you

might say, “How much money must come *out* of my pocket (hence the negative number) at the beginning, invested at 5% per year, to result in $1,000 coming *into* my pocket (hence the positive number) at the end of three years?”

Answer 4-2:

This problem is essentially the same as the first. Since you believe that you could use your money elsewhere to earn 4.5% per year, you insist on discounting any future return from this property at 4.5% per year. That discounted amount is the maximum you would pay to receive the future return.

You’ll need to locate a different snippet of the table of Present Values, one that will show you 4.5% and 10 years.

Annual Present Value Factors

Years	4.375%	4.500%	4.625%	4.750%	4.875%	5.000%	5.125%
1	0.958084	0.956938	0.955795	0.954654	0.953516	0.952381	0.951249
2	0.917925	0.915730	0.913543	0.911364	0.909193	0.907029	0.904874
3	0.879449	0.876297	0.873160	0.870037	0.866930	0.863838	0.860760
4	0.842586	0.838561	0.834561	0.830585	0.826632	0.822702	0.818796
5	0.807268	0.802451	0.797669	0.792921	0.788207	0.783526	0.778879
6	0.773430	0.767896	0.762408	0.756965	0.751568	0.746215	0.740907
7	0.741011	0.734828	0.728705	0.722640	0.716632	0.710681	0.704787
8	0.709951	0.703185	0.696492	0.689871	0.683320	0.676839	0.670428
9	0.680192	0.672904	0.665703	0.658588	0.651557	0.644609	0.637743
10	0.651681	0.643928	0.636276	0.628723	0.621270	0.613913	0.606652

You look for the intersection of those two variables to identify the factor you need: 0.643928

Next, you apply the formula Present Value = Factor from Table x Future Value

Present Value = 0.643928 x 85,000

Present Value = 54,734

With Excel, you use the PV function:

=PV(rate,nper,pmt,fv,type)

=PV(0.045,10,,85000)

Excel returns (54,734).