Financial Analysis for the Professional Engineer

An Online Continuing Education Course for Engineers

Course Number: BS-4007

Credit: 4 Hours / 4 PDH / 4 CPD

Financial Analysis for the Professional Engineer

Objectives of this Course:

The course advances the "standard engineering economics", taught at the college or continuing education level. This targets the professional engineer, engineer-manager, and engineer-owner. Participants will learn how to use, and not misuse, financial analytical tools for the decision-making process specifically applied to: project evaluation and project management, costing, contract negotiations, employee evaluation, revenue, profit and cash production, valuation of assets including buying and selling professional engineering practices

- Payback, NPV and IRR Calculations
- Dealing with the CFO of their operations and 'talking their language'
- The misuse of NPV and IRR
- Valuation techniques applied to capital budgeting

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Chapter 1

Speaking Two Languages

Wealth creation in a free market society is an underlying goal of the capitalist virtually forever……in fact, this might be an indirect definition of a capitalistic society: the ability to create wealth for oneself. What has been the key for most entrepreneurs in creating wealth? While there are exceptions, I will argue that wealth creation in the past few decades has come from individuals being able to speak two different languages.

The languages I reference are not traditional in the sense of "Spanish", "French" or "Russian". The separate languages, I suggest, are those that cross industry boundaries such as an engineer who understands the medical arena. An engineer adds value if he can relate stress-strain concepts to ball-and-joint synthetic limbs and communicates with medical professionals as easily as with other engineers. Or, the engineer who can tell the shop foreman how to make the design as the interior designer wanted, designed or developed.

Real world examples include Mr. Mark Cuban, the current owner of the Dallas Mavericks of the National Basketball Association (NBA). Mr. Cuban is a computer nerd who loves sports. He was frustrated that he could not listen or watch games that were not in his broadcast area. So, he crossed over his love for sports with his 'computer background' to create "Broadcast.Com", which was sold for several billion dollars (his share).

Advanced Financial Analysis, and the entire series of continuing education courses are designed to advance the professional engineer within his field while introducing or re-introducing languages from other disciplines; namely, finance and accounting arenas. It is easier for the professional engineer to pick up financial concepts than for a businessperson to understand engineering concepts. This should be an advantage that the professional engineer enjoys in the business arena.

Why Financial Analysis for Engineers

Budgetary concerns for many corporations including governmental agencies are always with us and they will never disappear. Our society, and even our human nature, has always looked for better, cheaper and faster ways of doing things. With the advent of the computer, or more specifically the personal computer, budgetary analysis has taken on a greater meaning in that most, if not all buyers are now being required to justify their decisions. This means the quantitative aspects of transactions must support decisions. As more quantitative activities increase, there is a need to understand both the advantages and disadvantages of such "quant" processes, especially those that can cause harm.

Likewise, as more buyers are utilizing 'quants', sellers now understand that the quantitative analysis could help them sell more. That is, sellers are coming up with their

own analysis and quantitative justifications and presenting these to their buyers. They justify their products, and not others. However, is this the correct people you want providing quantitative support for their own products? How biased would this be!?

In a classroom setting, this is the moment I would be picking up the "mouse" or "wireless keyboard" and professing:

"NEVER IN THE HISTORY OF MANKIND CAN WE COME UP WITH THE WRONG ANSWER FASTER" (*)

*(*Note: I did not originate this saying (**) but I know a good saying to borrow when I see it!) (** Cannot identify who I lifted….borrowed this)*

Like a scalpel a computer is a tool, which in the correct hands can perform great works…in the wrong hands, it can damage greatly. Financial analysis and the process of quantifying decisions can be viewed the same way. It is possible that the 'quants' and their models are manipulated in order for their project to be approved over some rival department. How can you tell? It might be impossible if you have a good programmer or financial modeler! If this were your money, you would want to understand where you are vulnerable and at risk. This is the focus of the following discussions.

The last item to cover before we get into the hard analytics revolves around 'numerical convention' and the usage of spreadsheet programs. To pass this course you will be required to successfully answer math questions in quantitative problems. You may use a handheld calculator to do so. However, since 100% of the financial professionals utilize some sort of spreadsheet program, we will incorporate such into this course. In using spreadsheets, signs are significant in some sense, and insignificant in others.

We use a negative amount as a cash outflow and a positive amount for a cash inflow. An investment, the outflow, will be designated at a -$10 or ($10) or (10). Each 'cell' or box will represent a time period. In all cases, we will stay with one-year time periods for convenience. Examples copied from spreadsheets will be inserted to help follow the discussions.

Chapter 2

The Simple Payback

The simple payback is the process used by many, if not most people in the world. It is incredibly unsophisticated and very low in math intensity. For such reason, schools and professionals tend to dismiss its use; however, this method is a valuable tool and should remain part of any and every analysis.

To proceed with this method of analysis, let me introduce you to "BUBBA". Everyone knows a Bubba…..he is the kind of guy who carries his entire 'bank account' in his left pocket…usually with a rubber band holding it. Bubba never went to college and may not have graduated from high school…..yet Bubba knows about risk and risk-versus-return from real-world experiences. I call the "Simple Payback" as the Bubba method.

If you ask Bubba to lend you money or become an investor in your opportunity, he usually asks several simple questions. The first few might be something like this *(slang intended)* :

"What you want the money for?"

"Where it is going?"

But the most important might be this question:

"When do I get my money back?"

"WHEN"!!!!

"When" is the key terminology for Bubba indicating 'time'. Note, Bubba does not ask for

'the risk-adjusted spread to US Treasuries', or

'what is the premium over a risk free rate' or

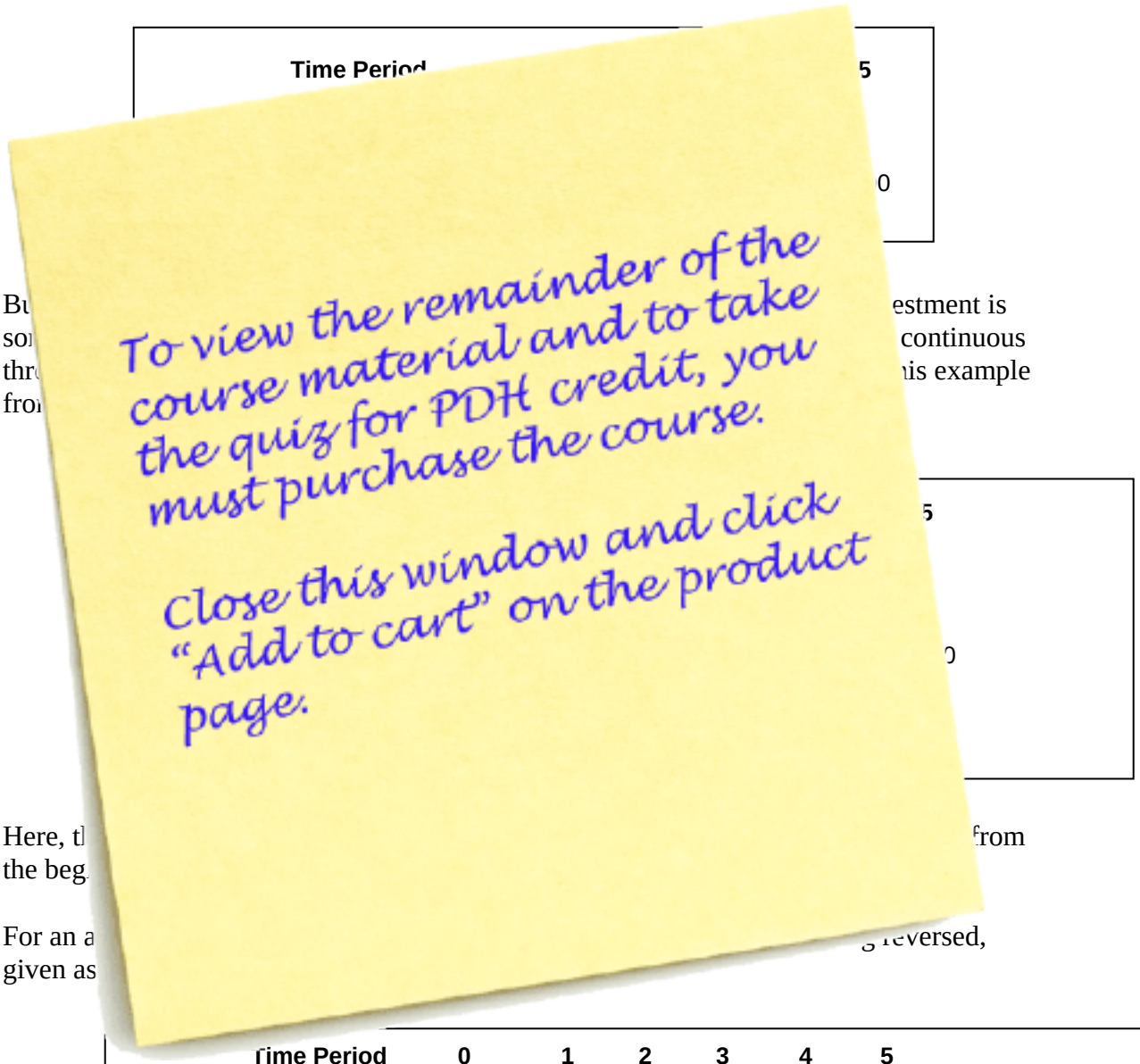
what is my total investment compounded annualize return'…..

it is simply when!

For poker players, those who bet on Pro Football, the horses or those that love gaming in places like Las Vegas or Atlantic City, the time you place your original stake in your

pocket and begin playing with "house money" is that 'sweet time' when you cannot lose *(right before you get sucked back in!)*.

Bubba wants to know when he gets his investment back. Look at the following example, with all cash flows going to Bubba:



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Time Period	0	1	2	3	4	5
Initial Investment or Loan	(1,000)					
Future Cash Flows		1,000	800	600	400	200
Net Out of Pocket	(1,000)	-	800	1,400	1,800	2,000