module2_lecture4

Mon, 12/27 3:50PM 10:26

SUMMARY KEYWORDS

summation notation, stocks, assignment, summation, portfolio, valued, adding, score, xn, w1, pn, p2, p1, terms, notation, x2, typically, compute, s1, company

SPEAKERS

Sumon Majumdar

Okay, so so far we have got familiar with the summation notation, and we have seen some examples of it. What I'm going to now introduce you to is a couple more slightly more involved examples, but which can still be handled by the summation notation. And I just wanted to give you a sense of how useful and versatile this notation is in the sense of various situations that it can actually be applied to. So we're going to now consider an example, similar to something that we had done in module one.

So here is Jim, and here's a portfolio, a financial portfolio which consists of three stocks. He has 10 Air Canada stocks, which are valued at $30 each, 50 Ford stocks which are valued at $12 each, and 20 TD stocks valued at $80 each. Now, if I wanted to ask you the question, what is the value of his portfolio? It's pretty simple, right? You have the 10 Air Canada stocks, which are each valued at $30, plus the 50 Ford stocks which are each valued at $12, plus the the 20 TD stocks which are each valued at $80. Right? And if we add all these three up, that gives the value of his portfolio. Now, suppose we were to make this slightly more general, right, instead of just three stocks, maybe Jim has a whole bunch of stocks, right. So a more general formulation of the same situation is that suppose Jim's portfolio consists of stocks of N companies, let's say he has X1 stocks of company one, which are each priced at P1 dollars, X2 stocks of company two, which are each priced at P2, and XN stocks of company N which are each priced at PN.

Now if I asked the same question, then what's the value of his portfolio? The idea is the same that we did with the three stocks now extended to N stocks. So what it means is that if you take the X1 stocks of company one, these are each priced at P1. So that's the value of the stocks that he holds from company one. What about company two, he has X2 stocks of those, and each of these are valued at P2. So that's the value of his stocks from company two. See if I add these two up, then similarly, now company three, he has X3 stocks, which are each valued at P3. And if I continue this way, because he has N company stocks, right, so for company N, he has XN stocks which are valued at PN. So if you want to get an idea of what's the value of his portfolio, it's the summation of all of these terms. But if we look at this, this is a summation, right? This is a summation of N terms. So can we use the summation notation to write this succinctly?

So how would we do that? So remember, if we're doing the summation notation, we need three things. Firstly, the summation sign. Secondly, what are we adding over, right. So, if you look at each of these terms, this is P2 X1, the next term is P2 X2, the third term is P3 X3, so on up to PN XN. So, each of the terms in the summation are of the form Pi times Xi. Whereas if i is 1, that means this is P1 X1, if i is 2, that's P2 X2, and so on. And third thing is, where does this index start from and where does it end? It starts from 1 and it goes up to N. Okay, so what we have done is we have written this particular summation, using the summation notation. And the only, it's very similar to what we have done before, the only thing here is instead of one series of numbers, so what we have is two numbers for each i, right? It's the price and the number of stocks of that particular company. So this is the product of two numbers. But for each i, we do that, and then we add it up over all the i's. So we portrayed this, this sum of all of these various quantities, just by our familiar summation notation.

So let me give you another example along these lines. Something which all of you encounter in one way or another. And this is, so for example, if you're doing a course, right, so typically, a course, if you want to compute the your final grade for the course, or the final mark for the course. Typically, a course is lots of different components. There are some exams, there are some projects, there are some exams and so on. Right? And you, and you have different weightages on different things. So for example, assignment one could be worth 5% of your weight. So that means the weightage on assignment one is 0.05. Maybe the second one is a bigger assignment which is worth 15%, right? So the weightage on that assignment is 0.15. And so on and so forth, right? So typically, if you look at a course, right, you're you're going to be faced with some, some version of a situation like this. That suppose you have five assignments in the course, right? And let's say W1 is the weightage on assignment one, and your score in that is S1. So let's think of this as the percentage score. Suppose the assignment one is worth 5%, that means the weightage on that is 0.05. And let's say you score 80% on that, on that assignment, so your score is 80, okay. Similarly, on assignment two, let's say the weightage is W2, the score is S2, and so on, and then a total of five assignments in the in the course. And at the end of the course, you're wondering, what's your overall score for the course?

So how would you compute that? So the way you would compute it is that you take your score in the first assignment, and multiply it by the weight that you have on that assignment. Then you take your second assignment score S2, and multiplied by the weight on that, and so on, and up to assignment five. So if you add all of these up, that's your total score for the course. So now, again, this is a summation here, right, and it's a summation of five terms. So now, we can again represent it by the summation notation. I'm going to use again, the sigma. And each term here is W. Let's say this is W2 times S2. This one is W1 times S1, this is W5 times S5. So each of the terms that you're adding a Wi times Si. And all you're doing is adding up from i equal to 1 to i equal to 5.

So again, this is a summation notation. And it involves exactly the same things that we have studied so far. It uses the summation, the sigma, then what are you adding over? So this is Wi Si. And where does the index run from, i equal to 1 to i equal to 5. So the only new thing here is that you have two in each of the terms that you're adding, right. There are two things which are indexed by i, the weight and the score. But other than that, it's the same notation that we have used so far. So let me stop this clip here. And in the next clip what I'm going to do is I'm going to show you a couple of simple properties of, of the summation notation.