

- Professor Amir: Today's session will be on the time value of money and inflation. There are two main concepts in finance. One of them is time value of money and number two is risk return relationship. Everything else revolves around these two concepts, time value of money and risk return relationship.
- Professor Amir: Why do we invest, that's the first question. Why people invest? Basically, investment is commitment of funds to an asset which probably gives some income as well as some capital gains or losses depending on what's the nature of the investment.
- Professor Amir: Now, we can invest on real investments or financial assets. What's the difference between the two? Real assets are tangible assets like properties, farm land, air craft, et cetera. Financial assets are like paper claims or electronic claims on certain assets that you cannot hold them tangibly, but you have a claim on them like stocks, bonds, derivative instruments, and so on.
- Professor Amir: Now as to why people invest? Because you have worked very hard for your money and at some point you let your money to work hard for you, as well. The purpose is to increase the wealth, because if you keep cash under your pillow, it will diminish in terms of value because inflation will eat to it.
- Professor Amir: What is wealth? Wealth is the value of current assets and possibly the present value of your future income from investment. If you don't invest, this is what opportunity costs. Or opportunity lost, essentially, if you don't invest.
- Professor Amir: Then, on the other side, if you don't invest, and you keep cash, as well know, inflation will eat into cash and your purchasing power will be reduced year on year or week on week, but what type of assets we can immerse apart from real and financial assets.
- Professor Amir: We can invest on assets with different type of income. Assets which have uncertain income, and we call those equities like projects, properties, commodities, air crafts, ships, we call them assets with uncertain cash flow. Uncertain revenue.
- Professor Amir: Then we have assets with certain revenue, we call them fixed income. These are like bonds or T-bills, or treasury notes, which their income is certain at the point of investment as long as they are not risky.
- Professor Amir: Then we have assets with contingent claims. Assets with contingent claims are those assets that their income or revenue depends on certain events. They're contingent on certain events, and these are what we call derivative instruments, like futures, swaps, options. Now, again, you can divide assets into different categories. Again, you can have equities like shares, preferred shares, ordinary shares, or even equity derivatives.

Professor Amir: Then you can have debt, and debt is when you invest your cash in a form of lending to someone or to a corporation or to a government, so this could be government bonds, corporate bonds, convertible bonds, or any other type of bonds we have or also derivatives on bonds.

Professor Amir: Property is very well known because you have commercial property, farm land. You can hold cash in a bank, and these are bank deposits, and also you can have money market instruments, and these money market instruments, I've said you can classify them as debt, but because they are so liquid they are equitable onto cash.

Professor Amir: Then you may have currencies, as well, so you may hold US dollars, Euros, or Yen, or Swiss Franc, or you may have other what we call alternative investments, where you can invest your cash or invest your money in alternative investments like commodities like oil, gold, silver, art, wine.

Professor Amir: The concept of time value of money, perhaps some of you may be familiar with it. For example, if you deposit \$100 in an account that is going to give you 10% interest, at the end of the year, how much would be the value of your deposit?

Speaker 2: \$110.

Professor Amir: \$110. Initial amount we call it 100, that is what is invested today in that account. Then 10% is what we call rate of interest, and 110 is the final value, so these are the concepts that we are going to work with.

Professor Amir: So, the final value would be, with our 100 initial investment, plus 10% of that 100 which is paid to you as an interest. We call it future value, but you can do this in reverse, as well.

Professor Amir: Basically, if I ask you, you are going to receive \$110 in a year time, and the rate of interest is 10%, so what do you do in this case? You discount the 110 that you are promised to receive in one year time by 10% to find its present value, so the present value is future value minus the amount of interest that is going to be earned.

Professor Amir: Present value is future value discounted at the rate of interest. The manufacturer is considering to refit a factory with a type of machinery which results in the following cash saving, basically, we use machinery in the factory that saves us some money.

Professor Amir: How much is the saving every year? Let's say 2,500, so 2,500 saving, over five years. Perhaps this machinery replaces labor. Now, if the interest rate that we assume is 15%, how much would be the value of this machine that will break even this machinery?

- Professor Amir: So, the required rate of return or interest rate is 15%. We discount each of these 2,500 by the discount rate of 15%. For the first year, 2,500 discounted 15%, second 2,500 discounted by one plus 15% power of two, and so on and so forth. If I find the value of all these items in my cash flow in the present value model, the sum of all those would be 8,380. It's the present value of all the savings that this machinery can make.
- Professor Amir: If the price of this machinery was \$10,000, would it be a viable investment? It wouldn't be, because why should you pay 10,000 and make a series of savings that their present value is 8,380?
- Professor Amir: Now, if the price of this new machinery was \$5,000, would you invest in this machinery? Probably yes, because you pay 5,000 today, but you make a series of savings where the present value of those series of savings is 8,380. This is how we discount the cash flows, in order to find their present value and then we compare the cash flows only on their present value.
- Professor Amir: Investors, to be convinced in order to invest in high risk projects, they demand higher rate of return and if you increase the rate of return or discount rate on a project, you discount the cash flows, the future cash flows at a higher rate, so you make them smaller, and the present value of the project will become smaller.
- Professor Amir: When I say project, it's any cash flow. It could be a bond as well.
- Professor Amir: Let's consider two projects. Project A and Project B. Project A generates for five years, 2-million every year, net of cost. Because this is a risky project, oil production is very risky, so we discount it at a rate of 15%. Now where do I get this? That's a different question for a different day, but let's say we discount this cash flat rate of 15%. So, a series of cash flow for five years, discounted at 15%. The value would be \$6.7-million.
- Professor Amir: We have another project, in terms of duration, it's the same. Cash generation is the same, 2-million a year, but this is a commercial property. Commercial property's less risky, so what we do, we discount it at a lower rate and we call the required rate of return for this project, let's say 8%. If it has got \$2-million for the next five years, at the rate of 8%, what you see there, will be \$7.9-million. So, present value of Project B is higher than the present value of Project A.
- Professor Amir: Similar cash flow, you increase the discount rate because of the riskiness of the project or assets or investment, its present value will go down. The value of the project will go down.
- Professor Amir: What about inflation? What is inflation? Inflation is the rate at which the general basket of consumer prices increases if you define a basket that every consumer or consumers, generally use, how much is the price of that basket

today. This basket could be anything, from bread, eggs, milk, what ever they consume, and you measure that price today. You can measure the price of the same basket one month from now.

Professor Amir: Let's say the price of everything, in general, increased by 2%. This is what we call monthly inflation, so the rate at which prices rise in a whole increase, we call it rate of inflation.

Professor Amir: Now, the Office of Statistics may use different measures for inflation. We have one index which we call Consumer's Price Index, which is the price of that basket that I mentioned to you. I don't know exactly what is in there, but we can find out what is exactly in the basket because every now and then they change it.

Professor Amir: But this is what we call the Consumer Price Index, and if you look at the growth on the Consumer Price Index, this is normally what governments put as inflation. But there are other indexes. For example, we have Producer's Price Index. Now, what is Producer's Price Index? It's the index based on factory gate prices, not retail prices we buy, as consumers, but how much factories sell to retailers, That's the Producer's Price Index.

Professor Amir: You can look at the growth in that, and that's inflation, as well.

Professor Amir: Every government, they measure this inflation because it's very, very important indicator as how the economy is doing, or how the monetary policies are working.

Professor Amir: The other concept is nominal interest rate. So far, we said we discount at this interest rate, discount at that interest rate, 8%, 5%, 15%, but what is a nominal interest rate? Nominal interest rate is the rate at which the money grows in the whole economy, but there is another hidden interest rate, we call it real interest rate.

Professor Amir: Real interest rate is the rate at which the purchasing power and investment increases, so it means that nominal interest rate adjusted with inflation. To find, for example, real interest rate for a given nominal interest rate and inflation, it's very simple. One plus real interest rate will be one plus nominal interest rate discounted for inflation.

Professor Amir: Now, we don't normally use the formula on the top, we use the formula which is at the bottom, which is a simple approximation. We say that, real interest rate is nominal interest rate minus rate of inflation. If the interest rate now is 4%, and inflation is 2%, the real interest rate would be approximately 2%, not exactly.

Professor Amir: Now, nominal interest rate is normally positive, but the real interest rate can become negative when inflation is higher than the nominal interest rate. You

deposit your money in the bank, and you can earn, for example, 5% interest rate, but imagine if inflation was 10%, it means that the real interest rate is negative. So, you're better off not to put your money in the bank, but invest it somewhere that you earn more than inflation.

Professor Amir: Under certain monetary policies, we want to target certain levels of inflation. We don't want inflation to be too low and interest rates to be too high, and also, at the same time, we don't want inflation to be too high and interest rates to be too low, so there should be some parity between the two.

Professor Amir: If interest rates on a savings is 5.9%, let's say this is the nominal interest rate that is paid to you, and inflation is 3.3%, how do you calculate the real interest rate? You can use the exact formula and exact formula of one plus rate of interest is 1 plus nominal interest discounted with inflation. That will give you 1.025. That is the real interest rate.

Professor Amir: If I use the approximation rate formula, it will be 2.6, because 5.9 minus 3.3, it will be 2.6, so it's not exact. It will give you some indication, when do we use real interest rate, when do we use nominal interest rate? The rule is very simple. You need to be consistent in handling inflation in your calculation.

Professor Amir: If you use nominal cash flow, that means the cash flows that are not adjusted with inflation, you need to use nominal interest for discounting. If you use deflated cash flows, that means cash flows that are adjusted for inflation, then you need to use real interest rate for discounting.

Professor Amir: Nominal interest rate for nominal cash flows, real interest rate for real cash flows. The present values that you get for both cash flows would be exactly the same if you use the two rules.

Professor Amir: That was it about time value of money, we care going to use a lot of these concepts, in terms of discounting, compounding and so on. This is like a stepping stone, we are going to expand on this into more real life examples.