Concept Questions – I
Sai Nishanth Mettu

sm11326

Lecture 1 : Overview

Question 1) Compare and contrast financial assets (securities) and real assets?

Solution : Hard assets are real tangible or intangible assets that generate cash flow, such as physical assets such as natural resources, land, plant and equipment, human capital, patents and goodwill. Financial assets are contractual claims entitling their holder to a cash flow stream over a period of time, or to a single cash flow typically at a set date and value, usually tied to the value or cash flows of another asset.

Question 2) What are the four main types of financial assets?

Solution : **Debt** is when you owe money that is backed by assets, like estate or financial investments and requires payments to settle the amount owed. **Equity** signifies a remaining entitlement, to a group of financial assets. Is frequently associated with corporate ownership and influence, within corporations. **Financial derivatives** are instruments that derive their value from another asset typically in the realm. **Money (as a medium of exchange)** is held to enable the completion of transactions.

Question 3) Describe the financial system and discuss how it adds value?

Solution : In the world of financethere exists a web of organizations that handle the creation and exchange of assets. It involves participants such, as governmental bodies and financial markets where these assets are bought and sold as well as intermediaries that assist in the process of creating and trading these assets inside or, outside these markets. This system boosts wealth in ways by directing funds to the promising projects and ensuring that firms make prudent investment choices in line, with the level of risk involved using funds from savers (investors). It also enables investors to maintain a level of consumption throughout their lives despite income fluctuations and aids, in managing risks by offering instruments that allow for risk diversification. The platform also motivates individuals, in the market to exchange insights. Enables investors to take advantage of the efficiencies gained through trading financial instruments.

Question 4) How do primary and secondary markets for securities differ?

Solution : In primary markets, new securities are sold directly to initial buyers, whereas in secondary markets, previously issued securities are traded among investors.

Question 5) What are financial intermediaries and what is their role in the financial system?

Solution : Financial intermediaries are actors or institutions that operate in financial markets but also have lives outside it. This raises two questions. First, what are the activities in which financial intermediaries generally engage? Second, how do these activities help finance economies? I highlight seven major roles for financial intermediaries: (1) reducing the costs of identifying saving or investment opportunities – ie, decreasing the search costs; (2) managing risks by providing insurance and hedging services – ie, providing risk management and portfolio services; (3) recombining risks or repackaging products or services into financial assets – ie, issuing financial assets; (4) providing information – ie, generating information; (5) leveraging economies of scale in buying or selling financial assets, whether individually or for large groups of agents – ie, creating liquidity; and (6) helping buyers of financial assets agree on prices -– ie, disrupting the endogeneity of asset prices.

Question 6) What is a mutual fund? What is an index fund? Why have mutual funds become increasingly popular over the last 30 years? Why have index funds become an increasingly popular type of mutual fund?

Solution : A mutual fund is something where there is a collective group that manages a pool of money contributed by investors. This money is invested based on pre-set guidelines, which typically specify the types of assets the fund can hold, though the specific makeup of the portfolio is usually left to the discretion of the fund manager. Investors buy shares in the fund at market value, which is determined by dividing the fund's total net asset value by the number of outstanding shares. The value of these mutual fund shares fluctuates with the value of the assets in the portfolio. All investors in the fund are invested in the same portfolio and thus receive the same investment returns, net of trading costs and fund expenses. Most mutual funds are actively managed, meaning the fund manager seeks to outperform the market by selecting stocks or timing the market.

Advantages of Mutual Fund :- Mutual funds provide two main advantages compared to directly investing in individual assets: <u>lower record-keeping and administrative costs, and reduced trading costs. These cost savings are a key reason for the growth of mutual funds, as they allow investors to hold diversified portfolios with many stocks at lower costs than if they managed the portfolios themselves.</u> Additionally, mutual funds offer the potential for better returns due to the fund-manager's skill.

Index Fund:- An index fun is a type of mutual fund designed to replicate the performance of a particular stock index, like the S&P 500 or other predefined indexes. Stock indexes are portfolios created based on predefined rules, such as the S&P 500, which includes 500 stocks chosen to reflect the overall U.S. stock market. Large stocks have a greater weight in the index than smaller ones, making it a value-weighted index. Index funds provide the same cost savings as other mutual funds but without the higher expense ratios of actively managed funds, which is why they've seen significant growth.

<u>In short, mutual funds, especially index funds, offer individual investors a cost-effective way to hold diversified portfolios</u>.

Question 7) A. Joe has just introduced you to his friend Jane. Without knowing anything more about her than her name, what, if anything, can be said about her preferences?

B. Joe has a choice between receiving $1 M today or $1 M in one year. Which does he prefer and why?

C. Briefly explain the concept of diversification.

D. What is the most important reason why two assets would have different expected returns?
E. Suppose two assets A and B pay $100 for certain in 1 year. In a well-functioning market, what can be said about the market prices of these two assets?

F. Joe and the seller agree on a price at which Joe will sign a contract to buy a house. Just before signing, Joe suddenly tells the seller that he will only sign if the seller includes a clause that will allow Joe to back out of the deal for 1 month after the contract is signed for any reason whatsoever. What should the seller do? Why?

G. Stock B has had very low earnings for the past year but analyst earnings forecasts are very high for the next year. What does market efficiency tell as about the profit potential associated with buying this stock today?

Solution : A. Joe just introduced me to his friend Jane. Without knowing anything beyond her name, I can infer that Jane likely prefers more over less and is risk-averse.

B. Joe has a choice between receiving $1 million today or in one year. He would naturally prefer to receive the $1 million now because he could invest it at a positive interest rate, increasing its value over the next year.

C. Diversification is the concept of spreading investments across a portfolio of assets. While individual assets may have similar average returns, portfolios with more assets tend to have lower volatility because the returns of the assets offset each other. The less correlated the assets are, the better they are at balancing each other out. Since most investors are risk-averse, diversification suggests holding a portfolio with many assets and selecting assets that don't move together in value.

D. The most important reason two assets would have different expected returns is the difference in their risk levels. Higher risk typically demands higher returns. Quantifying that risk is one of the objectives of models like CAPM, which helps measure the riskiness of an asset given investors' risk aversion.

E. If two assets A and B are set to pay $100 for certain in one year, their market prices should be the same in a well-functioning market. If they were priced differently, investors could exploit the arbitrage opportunity by buying the cheaper asset and selling the more expensive one, generating a risk-free profit. This is known as the law of one price, which states that identical cash flows must have identical prices, assuming no major tax, liquidity, or transaction cost differences.

F. If Joe suddenly demands a clause in the house purchase agreement that allows him to back out of the deal within one month for any reason, the seller should negotiate compensation for giving Joe that option. This clause gives Joe a valuable option, as he can back out if market conditions worsen. The seller should either raise the contract price or request an upfront fee to account for the option's value.

G. Although Stock B has had very low earnings over the past year, analysts predict high earnings for the next year. In an efficient market, the stock’s current price should already reflect both its past performance and future earnings forecasts. Therefore, buying the stock based on this publicly available information is unlikely to result in abnormally high returns, adjusted for risk. To consistently beat the market, an investor would need access to information not yet reflected in the stock price. This underscores the difficulty of consistently outperforming the market in an efficient market environment.

Lecture 1-2 : Time, Value and Money

1 Solution

To calculate the loan amount Jim will owe in 5 years, we use the future value formula:

$$V_{t+n} = V_t(1+r)^n$$

Where:

- $V_t = 20,000$ is the amount borrowed today.
- $r = 0.08$ is the effective annual interest rate.
- $n = 5$ is the number of years.

Substituting the given values:

$$V_5 = 20,000 \times (1+0.08)^5$$

$$V_5 = 20,000 \times (1.08)^5$$

$$V_5 = 20,000 \times 1.469328$$

$$V_5 = 29,386.56$$

Thus, Jim will owe $\$29,386.56$ in 5 years.

2 Solution

Jack needs \$30,000 in 2 years to buy a new car and can make deposits into a bank account that pays an effective interest rate of 0.5% per month.

A. Present Value Calculation

To determine how much Jack must deposit into the bank account today, we can use the present value formula:

$$V_0 = \frac{V_{t+n}}{(1+r)^n}$$

Where:

- $V_{t+n} = 30,000$ is the amount needed in 2 years or 24 months.
- $r = 0.005$ is the effective monthly interest rate.
- $n = 24$ is the number of months.

Substituting the values into the formula, we get:

$$V_0 = \frac{30,000}{(1 + 0.005)^{24}}$$

Calculating further:

$$V_0 = 30,000 \times (1 + 0.005)^{-24}$$

$$V_0 = 30,000 \times (1.005)^{-24} \approx 26,615.57$$

Thus, Jack must deposit approximately $26,615.57 today.

B. Effective Annual Rate

To find the effective annual rate (EAR) being offered by the bank account, we can use the following formula:

$$(1 + r_{12}) = (1 + r)^n$$

Here, $r = 0.005$ is the effective monthly rate, and $n = 12$ is the number of compounding periods in a year:

$$(1 + r_{12}) = (1 + 0.005)^{12}$$

Calculating this gives:

$$(1 + r_{12}) \approx 1.061678$$

Thus, the effective annual rate is:

$$r_{12} \approx 0.061678 or 6.1678\%$$

C. Annual Percentage Rate with Monthly Compounding

To express the interest rate as an annual percentage rate (APR) with monthly compounding, we use the formula:

$$i_{nom} = m \times r_{1/m}$$

Where m is the number of compounding periods per year. With monthly compounding, $m = 12$ and the effective monthly rate $r_{1/m} = 0.005$:

$$i_{nom} = 12 \times 0.005 = 0.06 or 6\%$$

It's important to note that the APR with monthly compounding is less than its EAR, which is always the case.

D. Continuously Compounded 1-Month Rate

To determine the continuously compounded 1-month rate, we can convert the effective per-period interest rate using the following formula:

$$r' = \ln(1 + r)$$

Where $r = 0.005$ is the effective monthly rate:

$$r' = \ln(1 + 0.005)$$

Calculating this results in:

$$r' \approx 0.004988 or 0.4988\%$$

Thus, the continuously compounded 1-month rate is approximately 0.4988%.

3 Question

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The continuously compounded 1-year interest rate is 9%.

A. Effective Annual Rate

To calculate the effective annual rate (EAR) from the continuously compounded interest rate, we use the following formula:

$$r = e^{r'} - 1$$

Where $r' = 0.09$ is the continuously compounded 1-year rate. Thus, we have:

$$r = e^{0.09} - 1$$

Calculating this gives:

$$r \approx 0.094174 or 9.4174\%$$

So, the effective annual rate is approximately 9.4174%.

B. Future Value of Investment After 6 Months

If Tom invests \$8,000 today at this effective annual rate, we can determine how much he will have in 6 months using the continuously compounded future value formula:

$$V_{t+n} = V_t \cdot e^{nr'}$$

Where:

- $V_t = 8000$ is the amount invested today.
- $r' = 0.09$ is the continuously compounded 1-year rate.
- $n = 0.5$ represents the time period in years (6 months).

Substituting the values into the formula, we get:

$$V_{0.5} = 8000 \cdot e^{0.5 \times 0.09}$$

Calculating this yields:

$$V_{0.5} \approx 8368.22$$

Therefore, after 6 months, Tom will have approximately $8,368.22.

4 Question

Joe makes two deposits into his bank account: $5,000 in 9 months and $12,000 in 15 months. The bank account offers an effective monthly interest rate of 0.5%. We want to determine how much Joe will have in his account 24 months from today.

To find the future value of each deposit at 24 months, we can use the future value interest formula:

$$V_{t+n} = V_t \times (1 + r)^n$$

Where:

- V_t is the amount deposited,
- r is the effective monthly interest rate (0.005), and
- n is the number of months until the future value is calculated.

We will calculate the future value of both deposits separately:
1. For the first deposit of $5,000 made in 9 months:

$$V_{24} = 5000 \times (1 + 0.005)^{15}$$

2. For the second deposit of $12,000 made in 15 months:

$$V_{24} = 12000 \times (1 + 0.005)^{9}$$

Calculating each term:
1. The future value of the first deposit:

$$V_{24} = 5000 \times (1 + 0.005)^{15} \approx 5388.41$$

2. The future value of the second deposit:

$$V_{24} = 12000 \times (1 + 0.005)^9 \approx 12550.93$$

Now, we can find the total amount in Joe's bank account in 24 months by adding these two values together:

$$Total = 5388.41 + 12550.93 \approx 17939.34$$

Therefore, Joe will have approximately $17,939.34 in his bank account in 24 months.

5 Question

Janet is set to receive monthly payments of $3,000 at the end of each month for the next 15 months. Given that she can borrow and invest at an effective interest rate of 1% per month, we can determine how much she can borrow today against these payments.

A. Present Value of the Annuity

To calculate how much Janet can borrow today, we will use the present value of an annuity formula:

$$V_0 = C \times PVAFr, N$$

Where:

- $C = 3000$ (the monthly payment),
- $r = 0.01$ (the effective interest rate per month),
- $N = 15$ (the number of payments).

Substituting the values into the formula:

$$V_0 = 3000 \times \left[\frac{1 - (1 + 0.01)^{-15}}{0.01}\right]$$

Calculating the present value factor:

$$= 3000 \times 13.865052$$

Thus, the amount Janet can borrow today is:

$$V_0 \approx 41595.16$$

B. Future Value of the Annuity

Next, we will calculate how much Janet will have in 15 months if she invests the 15 payments. We will use the future value of an annuity formula:

$$V_{15} = C \times FVAFr, N$$

Where:

- $C = 3000$,
- $r = 0.01$,
- $N = 15$.

Substituting into the formula:

$$V_{15} = 3000 \times \left[\frac{(1 + 0.01)^{15} - 1}{0.01} \right]$$

Calculating the future value factor:

$$= 3000 \times 16.096896$$

Thus, the total amount Janet will have in 15 months is:

$$V_{15} \approx 48290.69$$

In conclusion, Janet can borrow approximately $41,595.16 today against her annuity payments, and if she invests these payments, she will accumulate about $48,290.69 in 15 months.

6 Question

I obtained a $500,000 mortgage on January 1, 2010, with an APR of 12% compounded monthly. The loan duration is 25 years, and I make monthly repayments at the end of each month.

A. Monthly Payment Calculation

To find my monthly payment, C, I will use the present value annuity formula, which relates the loan amount to the monthly payments. The number of payments N is given by:

$$N = 25 \times 12 = 300$$

The monthly interest rate r is calculated as follows:

$$r = \frac{0.12}{12} = 0.01$$

Using the present value annuity formula:

$$V_0 = C \times PVAFr, N$$

Given that the amount borrowed today, V_0, is $500,000, we have:

$$500000 = C \times \left[\frac{1 - (1 + 0.01)^{-300}}{0.01} \right]$$

Calculating the present value annuity factor:

$$C = \frac{500000}{94.946551} \approx 5266.12$$

Thus, my monthly payment is approximately:

$$C \approx 5266.12$$

B. Outstanding Loan Balance After 5 Years

Next, I need to determine the loan balance outstanding after 5 years, which is just after the 60th loan payment. To calculate the value of the remaining 240 payments, I will again use the present value annuity formula:

$$V_{60} = C \times PVAFr, N$$

Where the remaining payments N are:

$$N = 300 - 60 = 240$$

Substituting the values into the formula:

$$V_{60} = 5266.12 \times \left[\frac{1 - (1 + 0.01)^{-240}}{0.01} \right]$$

Calculating the present value factor for the remaining payments:

$$= 5266.12 \times 90.819416 \approx 478266.01$$

Thus, the outstanding loan balance after 5 years is approximately:

$$V_{60} \approx 478266.01$$

C. Interest Accumulated in the 61st Month

To find the interest that accumulates in the 61st month of the loan, I can use the outstanding balance at the start of the 61st month:

$$Interest = Balanceatthestartofthe61stmonth \times r$$

So the interest accumulated is:

$$= 478266.01 \times 0.01 \approx 4782.66$$

In conclusion, my monthly payment is approximately \$5,266.12, the loan balance after 5 years is about \$478,266.01, and the interest accumulated in the 61st month is approximately \$4,782.66.

Lecture 2 – Concept Questions

Question 1. I. Suppose a call auction is held for QLM stock. At what price (or prices) do trades take place? Briefly explain how that price is (or those prices are) determined?

Solution : In a call auction for a security, all trades are executed at a single price, which is determined by the point where the number of shares demanded matches the number of shares supplied. Investors submit buy and sell orders that include both the price and quantity of shares they wish to trade. These orders are then aggregated to create supply and demand curves. The trades occur at the price where these two curves intersect, and this price is considered the equilibrium price for the security at that particular moment during the auction.

Question 2. Why are secondary markets for U.S. stocks continuous auctions with the exception of the NYSE each day at the opening?

Solution : Invstors trading U.S. stocks often require immediacy, but their orders don't arrive at the same time; instead, the order flow is fragmented throughout the day. A continuous auction system allows trades to happen at any moment, accommodating this fragmented order flow. This is why secondary markets for U.S. stocks operate as continuous auctions. Throughout the day, trades are executed at prices that fluctuate around the equilibrium price, depending on which party the buyer or the seller demands immediacy. The party seeking immediate execution pays a fee to the party providing it, and this fee is reflected in the bid-ask spread.

Question 3. Describe the main features of a dealer market. What is the other main type of continuous auction market?

Solution : In a dealer market, dealers, typically connected electronically, provide bid and ask quotes upon request. Their indicative bids and asks are widely shared, but trades are usually not reported. In this setup, a dealer always acts as the counterparty for customer trades. Another key type of continuous auction market is the limit order or "order" drivin market.