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Commodity Market

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Introduction

The commodity trading dates back to the dawn of human civilization as clans and kingdoms bartered and exchanged with one another. Commodity trading predated stock and bond trading by several centuries. Where commodity trade existed for centuries, but it wasn't appeared as we know it today until after the advent of modern means of transportation and communications.

The commodity market like any other market is either a physical or a virtual space, where stakeholders can trade commodities (raw or primary products) on the current or future date, according to the price determined by the supply and demand. Commodities can be energy, grain, livestock, and precious metals. The commodity trading environment like other asset classes, has two general forms of pricing: spot prices for immediate delivery and futures prices for delivery at a later date; it includes three types of trading participants: investors/hedgers, speculators, and arbitrageurs. Each trading participant has an objective in dealing, there are those who aim to hedge against the risks of commodity price fluctuations, and there are those who aim to make gains from the price movement. In commodity trading, we have to distinguish between physical and financial trading, Physical trading involves the transfer of goods from the seller's location to the buyer's destination. It is generally used by companies that are require the commodity as raw materials in its production process. Financial trading mainly involves the buying and selling of commodities on the exchanges to make gains or hedge against a price rise or fall. It does not involve any movement of goods. Spot and future prices of commodities is determined by supply and demand which are determined by several factors, including ease of storage, geopolitics, and weather. We will discuss these points in detail in the following axes:

- ❖ **Stock exchange: concept, Instruments and Indices**
- ❖ **What is the commodity markets?**
- ❖ **Risk management in commodity markets**
- ❖ **Applications of forwards and options in the commodity markets**
- ❖ **Commodity's Forward Pricing**
- ❖ **Speculation in commodity markets**
- ❖ **Short selling on futures markets**
- ❖ **Clearing and Settlement**

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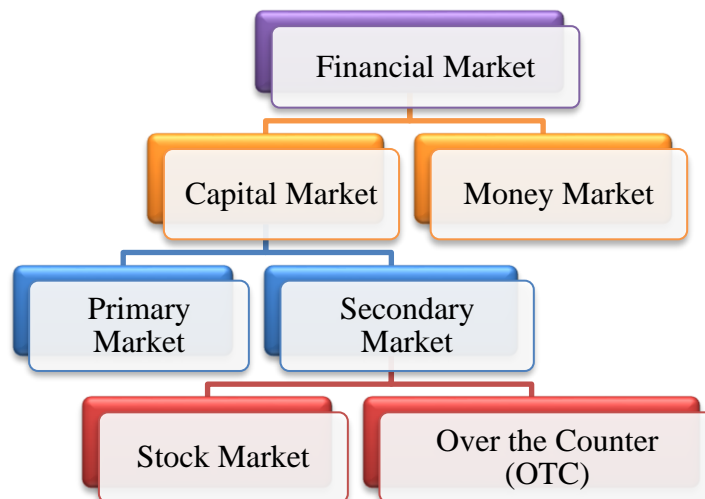
Chapter one:
stock exchange concept
Instruments and Indices

Financial market refers to any place or system where issuing and trading of financial assets take place; it acts as an intermediary between those who have capital with those who need capital. The market facilitates for buyers and sellers to trade their financial holdings. In addition to making it possible to raise capital, financial markets allow participants to transfer risk through derivatives. The stock market is just one type of financial market. stock market enables investors to buy and sell numerous types of financial instruments including equities, bonds, currencies, and derivatives. Some stock markets are small with little or locally activity, and others trade trillions of dollars of securities daily and at global level. Each stock market is represented by an index, which track the ups and downs of its stocks, the performance of the index reflects the health of the stock market and the economies as whole.

1. Stock Market Concept

The capital market is the market where corporations and governments issue financial assets such as bonds and shares to meet their medium to long-term financial needs. Capital market is splitted into two clusters: the primary market and the secondary market. The primary market is where securities are issued and traded in public for the first time; the securities can be debt-based (Bonds), equity-based (stock/ownership of a company). The first issue of a private company’s stock on the market is called initial public offering (IPO), which marks the company’s transition from being privately owned to publicly owned. The secondary market is where investors trade securities; which are already issued in the primary market, it’s called Stock exchanges.

Figure 1: Classification of Financial Market



Source: Author’ elaboration

1.1. Stock Exchange definition and types

1.1.1. Definition stock exchange: stock exchange is where different financial instruments are traded, including equities, commodities, currency and bonds. Exchanges bring corporations and governments, together with investors. Exchanges help provide liquidity in the market, meaning there are enough buyers and sellers so that trades can be processed efficiently without delays (Harper , 2022).

1.1.2. Types of stock markets: the stock exchange is divided into three categories as follows:

First - In terms of products traded in the stock market: we distinguish the following types: stock market, the commodity exchange, and the foreign exchange (Forex; FX).

- **Stock Market:** is a financial marketplace that matches those who want to buy securities with those who want to sell them; is the market in which securities such as stocks and bonds are traded. People invest in the stock market with the expectation of earning returns from price appreciation and dividends.
- **Commodity market:** is the one in which the price of strategic commodities (such as cotton, gold, oil, etc.) is determined. Examples: London Coffee Exchange and the Chicago Wheat Exchange.
- **Foreign exchange market (also known as forex, FX, or the currencies market):** refers to trading one country's money for that of another country. The kind of money specifically traded takes the form of bank deposits or bank transfers of deposits denominated in foreign currency (Melvin & Norrbin, 2017). The major players in the market are governments (usually through their central banks) and commercial banks, firms such as manufacturers, exporters and importers, and individuals such as international travelers also participate in the market. The foreign exchange is the action of converting one currency into another. (Li, 2016)

Second- In term of time: there is spot market and future market.

- **Spot market also known as the cash market or physical market:** is a public financial market in which commodities or financial instruments are bought and sold for immediate delivery (or within a couple of days, depending on local regulations) (Market Business News, n.d.). spot market is a financial market where financial instruments and commodities are traded for instantaneous delivery. Delivery refers to the physical exchange of a financial instrument or commodity with a cash consideration. The spot market is also

known as the cash market or physical market because cash payments are processed immediately, and there is a physical exchange of assets (Park, 2023).

- **Futures market are also called futures exchanges:** traders use futures exchanges to hedge against price volatility and speculate on the future prices of stock index, currencies, commodities, interest rates and other assets. A futures contract is a contract to exchange a particular security at a specific price on a specific future date (Duggan , 2022). **Futures market** is a financial marketplace where participants trade futures contracts for commodities, stock indices, currency pairs, and interest rates at a pre-determined rate and agreed-upon future date. It, thus, protects investors and traders from losing money on a transaction even if the price of the commodity or financial instrument rises or falls later (Wallstreetmojo Team, n.d.).

Third- In term of Geographical extent: there are:

- Stock market that operates locally.
- A stock market that operates at the international level- Global stock exchanges, such as New York stock exchange (NYSE), Nasdaq, Shanghai Stock Exchange (SSE).

1.2. Stock exchange procedures

How do buying and selling happen on the stock exchange? In a stock exchange, buying and selling happen completely electronically. Stock exchanges use electronic matching technology to enable buying and selling. Electronic matching is a technology where sellers are automatically connected with the stock exchange. For instance, person A wants to buy a share, and person B wants to sell. When person A place the order to buy, this automatically gets matched with the order of person B, who wants to sell. This is the modern technology that stock exchanges use. But it has advanced a lot from there. In the 20th century, traders had to be physically present in the stock market to participate. The new technology has helped increase participation in the market. But this has also increased the changes in volatility and other technical difficulties. Authorities have introduced different mechanisms to reduce volatility. For example, the Securities and Exchange commission's (SEC) margin requirements and the circuit breaker that the New York Stock and Chicago Mercantile Exchanges introduced.

2. Stock Market Instruments

2.1. Definition

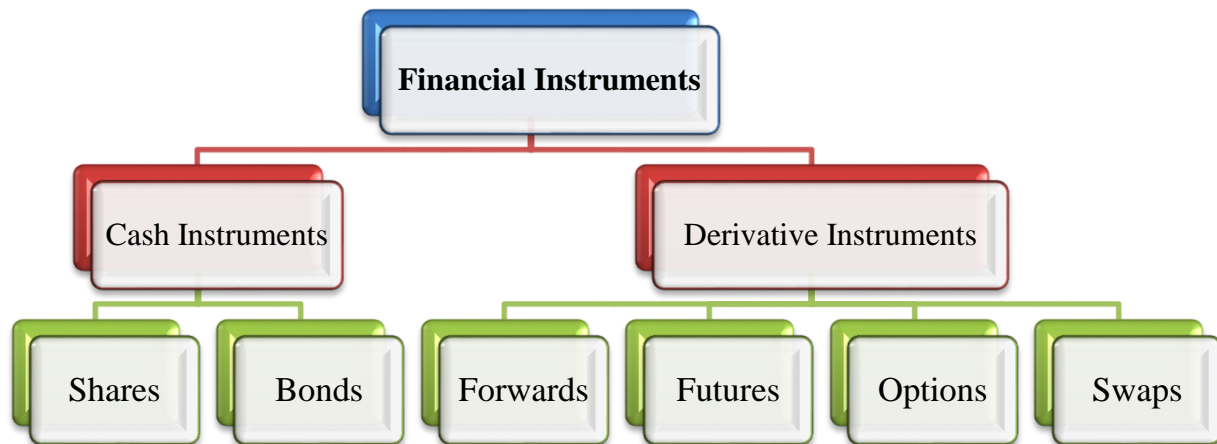
Stock Market Instruments are a financial instrument, that are defined as a document that indicates an asset to one individual (this person is owed) and a liability (this person owes) to another individual. Financial instruments are contracts for monetary assets that can be purchased, traded, created, modified, or settled for. In terms of contracts, there is a contractual obligation between involved parties during a financial instrument transaction. (CFI Team, 2023) .

For example, if a company were to pay cash for a bond, another party is obligated to deliver a financial instrument for the transaction to be fully completed. One company is obligated to provide cash, while the other is obligated to provide the bond.

2.2. Type of Financial instruments

There are typically two types of financial instruments: cash instruments, derivative instruments. The instruments also can be debt-based securities such as bonds, or equity-based such as stocks/shares; as well as derivatives.

Figure 2: Types of Financial Instruments



Source: researcher' elaboration

First- Basic or Cash financial instruments: Cash instruments are financial instruments with values directly influenced by the condition of the markets.; are the instruments used in trading operations such as shares and bonds (stock market security).

- I. **Equities – Shares:** are categorized as mechanisms that serve as legal ownership of an entity; it provides long-term finance for businesses compared to debt-based. Equity-holders have the ability to vote, get a portion of the company's profits, and seize its assets. A business that owns an equity-based financial instrument can choose to either invest further in the instrument or sell it whenever they deem necessary. There are five main types of shares, including (CFI Team, 2023):
 - i. **Ordinary shares :** these are the most popular type of shares because they give the shareholders a voting right. While ordinary shareholders have the highest potential financial gains, they are the last to pay if the company is to go bankrupt.
 - ii. **Non-voting ordinary shares :** these are ordinary shares that don't give the holder a voting right.
 - iii. **Preference shares :** Preference shares carry no voting right though their holders can receive preferential treatment when it comes to dividends. Preference shareholders often receive a fixed dividend.
 - iv. **Cumulative preference shares:** cumulative preference shares allow the holders to receive the dividend cumulatively. This means that if a dividend is not paid this year, it will be paid in successive years as long as the company still makes profits.
 - v. **Redeemable shares :** redeemable shares are sold on the agreement that the company can buy them back at a later date. Companies can't issue redeemable shares alone, they must also issue other non-redeemable types of shares.

- II. **Debt – Bonds:** An agreement known as a debt instrument permits one party to lend money to another party, who agrees to return the loan principal and interest. Because the lender receives a defined rate of interest during the course of the instrument, debt instruments are also known as fixed-income assets that represents a loan made by an investor to a borrower (typically corporate or governmental). Bonds are used by companies, municipalities, states, and sovereign governments to finance projects and operations. Owners of bonds are debtholders, or creditors. (Fernando, 2023)

Second-Derivatives is an instrument whose value is derived from the value of one or more underlying, which can be commodities, currency, bonds, stocks, stocks indices, etc. Four most common examples of derivative instruments are **Forwards, Futures, Options and Swaps**.

- i. **Forward contract** is an over-the-counter derivative contract in which two parties agree that one party, the buyer, will purchase an underlying asset from the other party, the seller,

at a later date and at a fixed price they agree upon when the contract is signed. (Derivative Markets and Instruments, 2022)

- ii. **Futures:** An agreement to buy or sell an asset at a predetermined price as of a future date. This is a standardized agreement, so that they can be more easily traded on a futures exchange. (AccountingTools, 2023)
- iii. **Option:** is a derivative contract in which one party, the buyer, pays a sum of money to the other party, the seller or writer, and receives the right to either buy or sell an underlying asset at a fixed price either on a specific expiration date or at any time prior to the expiration date. (Derivative Markets and Instruments, 2022)
 - **Call option:** An agreement that gives the holder the right, but not the obligation, to buy shares, bonds, commodities, or other assets at a predetermined price within a predefined time period. (AccountingTools, 2023)
 - **Put option:** An agreement that gives the holder the right, but not the obligation, to sell shares, bonds, commodities, or other assets at a predetermined price within a predefined time period. (AccountingTools, 2023)
- iv. **Swap:** is an over-the-counter derivative contract in which two parties agree to exchange a series of cash flows whereby one party pays a variable series that will be determined by an underlying asset or rate and the other party pays either a variable series determined by a different underlying asset or rate or a fixed series (Derivative Markets and Instruments, 2022).

3. Stock Market Index

3.1. Definition

Stock indexes are collections of stocks meant to represent the market or a portion of it—they are used by investors as benchmarks against which to compare the performance of their own portfolios (Salvucci , 2021).

A market index tracks the performance of a certain group of stocks, bonds or other investments. These investments are often grouped around a particular industry, like tech stocks, or even the stock market overall, as is the case with the S&P 500, Dow Jones Industrial Average (DJIA) or Nasdaq.

So, the stock market index is a basket of stocks reflect the performance of an industry, sector or the entire market itself.

3.2. Examples of leading stock market index:

1. S&P 500 – The top 500 stocks in the USA
2. Dow Jones Industrial Average – The top 30 stocks in the US.
3. Nasdaq Composite– All securities listed on the NASDAQ Exchange
4. FTSE 250 – is a capitalisation-weighted index consisting of the 101st to the 350th largest companies listed on the London Stock Exchange.
5. CAC 40– based on the market capitalizations of 40 large French companies.
6. SSE – Shanghai Stock Exchange
7. DAX 30 – Deutscher Aktien Index 30, German stocks.
8. Nikkei 225 – is the main stock market index of the Tokyo Stock Exchange. The term Nikkei is the abbreviation of “Nihon keizai shinbun”, the name of the economic daily which publishes this index. It is made up of 225 companies.
9. NIFTY 50 – The top 50 stocks of the NSE of India.
10. KSE-100 – index based on the value of 100 selected stocks listed on the Karachi Stock Exchange.

When calculating a stock index, there is no specific size or number of shares that are included in the calculation. The DAX- 30 only has 30 stocks while the S&P 500 has 500. What’s important is that each has a large enough sample size to represent the general behavior of the market. Each stock market index uses its proprietary formula when determining which companies or investments to include.

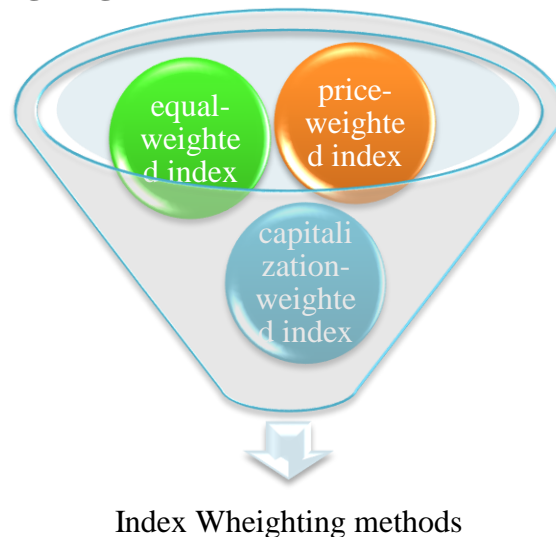
3.3. How is stock market index calculated?

There are several types of indices, but the method of calculating them is based on the same basis: an appropriate sample, and a clear definition of weights. In the stock market, the sample means a group of securities used in calculating the index, and it is required that this sample be appropriate in three aspects: size and source. Indexes that measure the performance of the market may only include companies that rank highly in terms of market capitalization, or the total value of all of their outstanding shares. After selecting the sample representing the index, the technical procedures are taken to determine the relative weight of the stocks.

3.3.1. Types of stock index

Once an index manager has determined which companies to include, then they need to determine how those companies are represented in the index, a factor called index weighting. Depending on weighting, all companies included in an index can have an equal impact on index performance or a different impact based on market capitalization or stock price.

Figure 3: Index weighting method



Source: researcher' elaboration

The three most common index weighting models are:

- i. **Equal Weighted:** With an equal-weighted index, the index treats all components like they are the same weight. This means each company's performance affects the index by the same amount, whether they're large companies or small.

Example: By giving an equal relative value to each type of stock within the index. Means that, if the index consists of 5 types of stocks, the weight of each one will be 0.2.

$$W_i = 1/N \dots \dots (1); \quad N \text{ is number of stock in the index}$$

- ii. **Price Weighted:** A price-weighted index grants each company a different weight based on its current stock price. Companies with larger share prices have more clout in these indexes, regardless of how big or small the companies actually are. Price Weighted, represents the ratio of the price of one stock to the total prices of all stocks on which the index is based.

$$W_i = \frac{P_i}{\sum_{i=1}^n P_i} \dots\dots\dots(2)$$

Example: Let's assume the index X consist of five stocks A, B, C, D, E their prices are as follows: 60, 40, 30, 20 and 50 respectively. From this example, the total value of the group of stocks in which the index is composed is equal to (60+40+30+20+50)=200 Then the weight of the stocks are:

$$W_A = 60/200 = 0.3, W_B = 40/200 = 0.2, W_C = 30/200 = 0.15, \\ W_D = 20/200 = 0.1, W_E = 50/200 = 0.25$$

iii. The Capitalization-Weighted : is a type of stock market index in which each component of the index is weighted relative to its total market capitalization. In a capitalization-weighted index, companies with larger market capitalization exert a greater impact on the index value. Companies with a smaller market capitalization carry less significance. (CFI Team, 2023)The weight of each stock is the ratio of its market value to the total market value of all the stocks that compose the index. It is calculated using the following formula (CFI Team, 2023):

$$W_i = \frac{P_i Q_i}{\sum_{i=1}^N P_i Q_i} \dots\dots\dots(3)$$

Market Capitalization = Stock Price (P_i) x No. of Shares Outstanding (Q_i)

Example : suppose an index consist of three types of stock as follow:

stock	Price (P _i)	Numeber of shares outstanding (Q _i)	Market Capitalization (P _i *Q _i)	Weight
A	20	100000	2000000	0.5
B	40	30000	1200000	0.3
C	25	32000	800000	0.2
Total			4000000	

3.3.2. The Index Price and Index Value - calculation methods

After calculated the weight, the index value can be calculated as follow:

$$Index_t = \frac{\sum_{i=1}^N P_{it} \times W_{it}}{\sum_{i=1}^N P_{it-1} \times W_{it-1}} \text{ Begning index value } \dots\dots\dots(4)$$

Knowing that:

- P_{it} : is the price of stock i in day 2
- P_{it-1} : is the price of stock i in day 1
- W_{it} : is the weight of stock i in day 2
- W_{it-1} : is the weight of stock i in day 1
- N : the total number of the stock that compose the index

i. **Equal weights Index**, the value of the index is the average of the prices of the stocks that compose the index.

Example: suppose an index composed of three types of stocks A, B, and C, and suppose that the base value is 100.

Stock	P_{it-1}	P_{it}	Explanation
A	60	70	The Index Price = $\sum_{i=1}^N P_i W_i$ The weights are equal, i.e. $W_{it} = W_{it-1} = 1/3$ Hence the Index Price in the first day is $(60+40+20)/3=40$ And the second day Index Price is $(70+50+30)/3=50$ The Index Value = $(\sum_{i=1}^N P_{it} W_{it} / \sum_{i=1}^N P_{it-1} W_{it-1}) * 100 =$ $(50/40) * 100 = 125$
B	40	50	
C	20	30	
Index Price			

Applying Equation 4, we find that the index value is $(50/40)*100=125$

Index on day 1 is 100 and on day 2 is 125, hence market is 25 points higher on day 2.

It also represents the return that is calculated: $\frac{PI_t - PI_{t-1}}{PI_{t-1}}$ Based on the results of the above table, we find: $(125 - 100)/100 = 0.25$ or 25%

ii. **Price-weighted Index:** calculating the Index Price and the Index value according to the method of price weighted, mean that the prices of each stock in the index are weighted relative to the sum of the prices of all the stocks that compose this index. Then we calculate **the price of the index** which is the price multiplied by weight, and the index value is calculated according to equation 4.

Example: assume that the index consists of three types of stocks A, B, and C, and let us assume that the base value is 100

<i>stock</i>	P_{it-1}	P_{it}	W_{it-1}	W_{it}	$P_{it-1} * W_{it-1}$	$P_{it} * W_{it}$
A	80	70	0.5	0.5	40	35
B	50	42	0.3125	0.3	15.625	12.6
C	30	28	0.1875	0.2	5.625	5.6
Total	160	140	1	1	61.25	53.2
Index price	////////	////////	////////	////////	61.25	53.2

The Index Price on the first day (day 1) is: $\sum_{i=1}^N P_{it-1} W_{it-1} = 61.25$; The Index Price on the second day (day 2) is: $\sum_{i=1}^N P_{it} W_{it} = 53.2$

Applying Equation 4, we find that the index value is $(53.2/61.25)*100=86.857$

Index on day 1 is 100 and on day 2 is 86.857, hence market is 13.143 points lower on day 2.

It also represents the return that is calculated: $\frac{PI_t - PI_{t-1}}{PI_{t-1}}$ Based on the results of the above table, we find: $(53.2 - 61.25)/61.25 = -0.13143$ or -13.143%

- iii. **Capitalization-Weighted Index:** calculating the Index Price and the Index value according to the capitalization weighting method, mean that the market value of the stocks that compose the index is weighted relative to the total market value as in Equation 3. Then we calculate the index price which is the price multiplied by weight, and the index value is calculated according to Equation 4.

Example: assume an index consisting of three types of stocks, A, B, and C. Let us assume that the base value is 100.

<i>stock</i>	P_{it-1}	P_{it}	Q_i	$P_{it-1} * Q_i$	$P_{it} * Q_i$	W_{it-1}	W_{it}	$P_{it-1} * W_{it-1}$	$P_{it} * W_{it}$
A	60	70	1000	60000	70000	0.25	0.28	15	19.6
B	80	90	1500	120000	135000	0.5	0.54	40	48.6
C	75	56.25	800	60000	45000	0.25	0.18	18.75	10.125
Total	////////	////////	////////	240000	250000	1	1	73.75	78.325
Index Price	////////	////////	////////	////////	////////	////////	////////	73.75	78.325

The Index Price on the first day (day 1) is: $\sum_{i=1}^N P_{it-1} W_{it-1} = 73.75$; The Index Price on the second day (day 2) is: $\sum_{i=1}^N P_{it} W_{it} = 78.325$

Applying Equation 4, we find that the index value is $(78.325/73.75)*100=106.2$

Index on day 1 is 100 and on day 2 is 106.2, hence market is 6.2 points Higher on day 2.

It also represents the return that is calculated: $\frac{PI_t - PI_{t-1}}{PI_{t-1}}$ Based on the results of the above table, we find: $(78.325 - 73.75) / 73.75 = 0.0620$ or 6.2%.

3.3.3. Why do stock markets move up and down?

The stock market is a complex, interrelated system composed of large and small investors making uncoordinated decisions about a huge variety of investments. There are factors that can help explain up and down market movements ; as shown in the following figure.

Figure 4: the factor that cause the market to go up and down



Source : (Hall, 2021) <https://www.investopedia.com/ask/answers/100314/what-are-key-factors-cause-market-go-and-down.asp>

The stock market is simply a collection of publicly-listed companies. And the index of stock market is calculated based on a group of securities (price of the securities -Shares- and the weight of the company). The shares price of these companies fluctuate based on supply and demand. If there are more investors buying into the market it will go up and vice versa. The investor buy share to make a profit which can be a dividend (which depend on the profitability of company) or the gain from buying low and selling high (this form the supply and demand

size). Macroeconomic factors such as interest rates and inflation, political events and natural disasters like a global pandemic can affect investor sentiment towards the stock market. For instance, if the investor think that an event, regulation or news can affect negatively the company's profitability this push them to get rid of these shares means more supply than demand then the shares price will go down and this would be reflected on the stock market index (the index goes down). On the other hand, if there is an event, news or regulation that can positively affect the profitability of the company, then this will motivate investors to buy the shares of this company, this increases the demand and leads to a rise in share prices and then a stock market index will go up. Other events that are more specific to an individual company, such as annual results or negative media coverage can also impact their share price. Stock markets are forward looking in how they operate. The outlook for the economy plays a big role in the direction the stock market moves. Are things set to get better or worse? If the outlook is bright, investors might decide it's the right time to be invested.

If we take an example of the shares of the airlines, any news related to the OPEC meeting to cut production leads to a decline in the company's stock prices Why? Because the airlines use **kerosene which is the fuel and is a composed on petroleum, so if there is a rumor about OPEC cut production decision, this make investors expect kerosene price rise (because oil price will goes up) and a decrease the airlines profitability, this will be reflected on the dividends they earn from holding the shares; so this push the investors to sell the company's shares and this will influence the shares price and then the stock market index where this company is listed.**

Demand for a particular stock can also be affected by sentiment toward its industry. For example, if Tesla reports record earnings, the stock prices of all EV companies may rise as investors gain confidence in the future of the EV industry. The opposite is also true if investors sour on an entire industry. (Olson, 2022)

Furthermore, increasing confidence in the stock market as a whole can push up demand (and prices) for individual stocks across the board. Contrarily, if the economy weakens or appears to be weakening, every stock may suffer. (Olson, 2022)

Practice Questions

Exercise 1: answer the following questions

1. What are the Common ways for firms to raise capital?
2. What is the market capitalization, how is it calculated, give an example?
3. What financial instruments are traded in capital markets?
4. What is the difference between the primary market and the secondary market?
5. What do you think happens when a firm, sells a share of stock?
6. What happens when an individual buys a share of stock?
7. Why do corporations sell stocks?
8. What is the process of selling stock to the public called?
9. Who sets the price of a share of stock?
10. Why do individuals buy stock in corporations?
11. What happens if the price of a stock goes down?

Exercise 2: choose the right answer

2. What are the main functions of the capital market?
 - **Raise capital**
 - **Connect buyers and sellers of securities**
 - **Boost economic growth**
 - **Consumption smoothing**
3. Financial assets in the capital market have maturity dates of over a year.
 - **True**
 - **False**
4. The securities in the capital market can be _____ or _____
5. The IPO process is also referred to as going public. This means the company transitions from _____
6. Corporate bonds are debt securities issued by _____ to raise capital for their financial needs
7. If you buy a stock, then _____.
 - **You're giving a loan to the company**
 - **You own part of the company**
 - **You have the option to buy a piece of the company**
 - **You own multiple companies at once**

8. The stock market is one physical location where people buy and sell stocks.
- **True**
 - **False**
9. Stocks offer _____ risk for potentially _____ returns.
- **Higher/Higher**
 - **Higher/Lower**
 - **Lower/Higher**
 - **Lower/Lower**
10. Primary capital markets are the platform where:
- **New securities are issued**
 - **New securities are sold**
 - **New securities are borrowed**
 - **Both (a) Both (a) and (b)**
11. The secondary market is a platform in which
- **Only earlier allotted securities are being traded among investors.**
 - **Investors trade in new securities**
 - **Individually cannot participate**
 - **None of these**
12. What are the best-known capital markets?
- **The stock market**
 - **The bond markets**
 - **A depository account with any of the depositories**
 - **Both (a) & (b)**
13. The marketplace in which instruments of securities are exchanged directly between the fundraiser and the purchaser is termed as?
- **The primary market**
 - **The tertiary market**
 - **The secondary market**
 - **The relative market**
14. Which terminology best defines the payments paid to shareholders in exchange for their share of the company's profits?
- **Coupon**
 - **Interest**
 - **Dividends**
 - **None of the above**
15. What is the stock market?
- **A type of farmers market where people buy and sell food.**
 - **A place where parts of businesses are bought and sold.**
 - **A special type of grocery store that sells stocks.**

- **A type of bank that gives out loans to new businesses**

16. The name for a part of a business that is bought and sold on the stock market is:

- **Part**
- **Marker**
- **Stocker**
- **Share**

17. Why would a company need to issue stock?

- **To increase its' customer base.**
- **To raise money.**
- **To stop the government from regulating it.**
- **To show customers that it's successful.**

Exercise 3: choose the right answer

1. The stock market index is based on sample of
2. According to the equal weight, if we have 10 stocks that compose an index, then the weight of each stock is:
 - 0.5
 - 0.1
 - 0.2
3. According to the price-weighted method, if an index is composed of four stocks A, B, C, D their prices are as follows: 40, 50, 25 and 10 respectively. then the weight of each stock is:
 - A :0.4, B :0.5, C :0.25 and D :0.1.
 - A :0.32, B :0.4, C :0.2 and D :0.08.
 - A :0.4, B :0.30, C :0.25 and D :0.5.

Exercise 4: Let the X stock exchange have 5 companies listed

<i>Stock</i>	<i>Number of share outstanding Q_i</i>	<i>P_{it-1}</i>	<i>P_{it}</i>
<i>A</i>	<i>5000</i>	<i>40</i>	<i>30</i>
<i>B</i>	<i>1000</i>	<i>50</i>	<i>55</i>
<i>C</i>	<i>2000</i>	<i>30</i>	<i>25</i>
<i>D</i>	<i>1500</i>	<i>20</i>	<i>25</i>
<i>E</i>	<i>3000</i>	<i>60</i>	<i>70</i>

Question:

- Calculate the index price and the index value according to the three methods? Is the value of the index increased or decreased?

Answers

Answers of the exercise n°1

1. What are the Common ways for firms to raise capital?

The Common ways for firms to raise capital are issuing securities (shares or bonds)

2. What is the market capitalization, how is it calculated, give an example?

Market capitalization refers to how much a company is worth as determined by the stock market. It is defined as the total market value of all outstanding shares. It is calculated as follow:

*Market Cap = Current Share Price * Total Number of Shares Outstanding*

For example, consider Bitcoin trading at roughly \$24,000 per coin as of mid-August 2022. At the time of writing, there are also approximately 19.1 million Bitcoin issued. Therefore, Bitcoin's market cap calculations are:

*Market Cap = \$24,000 * 19.1 million = \$458.4 billion*

3. What financial instruments are traded in capital markets?

The financial instruments that are traded in capital markets are: debt instrument such as Bonds
Equity such as shares, derivatives such as Options, Swaps, Futures and forwards.

4. What is the difference between the primary market and the secondary market?

The difference between primary market and secondary market is: In a primary market, new shares and bonds are offered to the public for the first time via an initial public offering (IPO). The secondary market, on the contrary, refers to exchanges where stocks are traded.

5. What do you think happens when a firm, sells a share of stock?

When a firm sells a share of stock, means sells a piece of its ownership.

6. What happens when an individual buys a share of stock?

When individuals buy a share, this means they buy a piece of ownership in the company.

7. Why do corporations sell stocks?

To be able to raise capital to invest more (create new investments or expand existing ones).

8. What is the process of selling stock to the public called?

It is called Initial Public Offering (IPO)

9. Who sets the price of a share of stock?

The price is set through a market interaction of buyers and sellers.

10. Why do individuals buy stock in corporations?

The individuals buy a shares because they expect the prices will go up to make a money; they can earn dividends.

11. What happens if the price of a stock goes down?

When price goes down, the individual buyer will lose value and possibly lose money.

Answers of the exercise n° 2

1. What are the main functions of the capital market?
 - **Raise capital**
 - **Connect buyers and sellers of securities**
 - **Boost economic growth**
2. Financial assets in the capital market have maturity dates of over a year.
 - **True**
3. The securities in the capital market can be **debt base (Bond)** or **equity base (share)**
4. The IPO process is also referred to as going public. This means the company transitions from **private owned to public owned**
5. Corporate bonds are debt securities issued by **corporate** to raise capital for their financial needs
6. If you buy a stock, then **you own part of the company.**
7. The stock market is one physical location where people buy and sell stocks.
 - **True**
8. Stocks offer higher risk for potentially higher returns.
 - **Higher/Higher**
9. Primary capital markets are the platform where:
 - **Both (a) and (b)**
10. The secondary market is a platform in which
 - **Investors trade in new securities**
11. What are the best-known capital markets?
 - **Both (a) & (b)**
12. The marketplace in which instruments of securities are exchanged directly between the fundraiser and the purchaser is termed as?
 - **The primary market**
13. Which terminology best defines the payments paid to shareholders in exchange for their share of the company's profits?
 - **Dividends**
14. What is the stock market?
 - **A place where parts of businesses are bought and sold.**
15. The name for a part of a business that is bought and sold on the stock market is:
 - **Share**
16. Why would a company need to issue stock? **To raise money.**

Answers of the exercise n° 3

1. The stock market index is based on sample of **Stocks**
2. According to the equal weight, if we have 10 stocks that compose an index, then the weight of each stock is: **0.1**

Explanation: according to the equal weighting, the weight of each stock in the index is calculated as follow: $W_i = 1/N$, N: number of stocks composing the index; means the weight $1/10 = 0.1$

3. According to the price-weighted method, if an index is composed of four stocks A, B, C, D their prices are as follows: 40, 50, 25 and 10 respectively. then the weight of each stock is:
 - **A :0.32, B :0.4, C :0.2 and D :0.08.**

Explanation: according to the price-weighting, the weight of each stock in the index is calculated as follow: $W_i = \frac{P_i}{\sum_{i=1}^N P_i}$, N: number of stocks composing the index; P_i : is the price of stock i .

$$\sum_{i=1}^N P_i = 40 + 50 + 25 + 10 = 125$$

$$W_A = \frac{40}{125} = 0.32, W_B = \frac{50}{125} = 0.4, W_C = \frac{25}{125} = 0.2, W_D = \frac{10}{125} = 0.08$$

Exercise n° 4 answer

Calculate the index price and the index value according to the equal weight method: The index price = $\sum_{i=1}^N P_i W_i$, the weight of each stock in the index is calculated as follow: $W_i = 1/N$, N: number of stocks composing the index; means the weight $1/5 = 0.2$

<i>Stock</i>	P_{it-1}	P_{it}	$W_{it} = W_{it-1}$	$W_{it-1} * P_{it-1}$	$W_{it} * P_{it}$
A	40	30	0.2	8	6
B	50	55	0.2	10	11
C	30	25	0.2	6	5
D	20	25	0.2	4	5
E	60	70	0.2	12	14
<i>total</i>	////////////////////	//////////	1	////////////////////	////////////////////
<i>Index price</i>	////////////////////	//////////	////////////////////	40	41

Applying Equation index value $I = \frac{\sum_{i=1}^N W_{it} \times P_{it}}{\sum_{i=1}^N W_{it-1} \times P_{it-1}} \times \text{begining value}$, we find that the index value is $(41/40) * 100 = 102.5$ Index on day 1 is 100 and on day 2 is 102.5, thus market is 2.5 points higher than on day 1 (the index is increased).

2 Calculate the index price and the index value according to the equal-weighted method: The index price = $\sum_{i=1}^N P_i W_i$, the weight of each stock in the index is calculated as follow: $W_i = \frac{P_i}{\sum_{i=1}^N P_i}$,

Stock	P_{it-1}	P_{it}	W_{it-1}	W_{it}	$W_{it-1} * P_{it-1}$	$W_{it} * P_{it}$
A	40	30	0.2	0.146	8	4.38
B	50	55	0.25	0.268	12.5	14.74
C	30	25	0.15	0.122	4.5	3.05
D	20	25	0.1	0.122	2	3.05
E	60	70	0.3	0.341	18	23.87
total	200	205	1	≅1	//////////	//////////
Index price	//////////	//////////	//////		45	49.09

Applying Equation index value $I = \frac{\sum_{i=1}^N W_{it} \times P_{it}}{\sum_{i=1}^N W_{it-1} \times P_{it-1}} \times \text{begining value}$, we find that the index value is $(49.09/45) * 100 = 109.09$ Index on day 1 is 100 and on day 2 is **9.09**, thus market is 9.09 points higher than on day 1 (the index is increased).

3 Calculate the index price and the index value according to the capitalization-weighting method:

The index price = $\sum_{i=1}^N P_i W_i$, the weight of each stock in the index is calculated as follow: $W_i = \frac{P_i \times Q_i}{\sum_{i=1}^N P_i \times Q_i}$

Stock	Q_i	P_{it-1}	P_{it}	$Q_i * P_{it-1}$	W_{it-1}	$Q_i * P_{it}$	W_{it}	$W_{it-1} * P_{it-1}$	$W_{it} * P_{it}$
A	5000	40	30	200000	0.385	150000	0.298	15.4	8.94
B	1000	50	55	50000	0.096	55000	0.109	4.8	5.995
C	2000	30	25	60000	0.115	50000	0.099	3.45	2.475
D	1500	20	25	30000	0.058	37500	0.075	1.16	1.875
E	3000	60	70	180000	0.346	210000	0.418	20.76	29.26
Total				520000	1	502500	≅1	45.57	48.545
Index Price									

Applying Equation index value $I = \frac{\sum_{i=1}^N W_{it} \times P_{it}}{\sum_{i=1}^N W_{it-1} \times P_{it-1}} \times \text{begining value}$, we find that the index value is $(48.545/45.57) * 100 = 106.528$ Index on day 1 is 100 and on day 2 is **6.528**, thus market is 6.109 points higher than on day 1 (the index is increased).

**Chapter two:
What is the commodity
market?**

Commodity play a crucial and vital role in our daily existence; commodity trading has been around for centuries, but it wasn't like we know it today until the emergence of modern transportation and communications. Commodity trading is very important for everyone as it helps to ensure the stability of the prices of these commodities and their availability when they are needed. The existence of a commodity exchange helps in regulating prices, promoting competition and preventing monopolies. It also encourages investment in the production of goods, which leads to increased efficiency and technological progress.

The roots of commodity trading can be traced back as early as between 4500 BC and 4000 BC in Sumer (Iraq). The Sumerians used clay writing tablets that contained information such as the number of goods to be delivered, date of delivery, etc. Such a contract looks like the today's futures derivatives contract. In the early days, civilizations were involved in the trading of goods such as cattle, gold, silver, grains, etc. The establishment of the Chicago Board of Trade (CBOT) in the 19th century was an important milestone in the history of commodity trading. CBOT initially offered commodity trading for corn and wheat with further expansion to plywood and silver in 1969. The volumes in commodity markets have grown at an exponential rate with further potential to rise with the advent of modern technology and online trading (ComFin Software, 2022).

1. Basics of Commodity Market

1.1. Definition of commodity market: the commodity market is a marketplace for buying, selling, and trading raw materials or primary products. (Hayes, Commodity Market: Definition, Types, Example, and How It Works, 2021). The term “Commodity” refers to the standardised resources or raw materials and/or primary agricultural products mined, grown with intrinsic value that are used to manufacture refined goods. Some examples of commodities are Cotton, Corn, wheat, Sugar, Rice, Gold, Oil, Natural gas, etc.

1.2. Type of commodities: in general, commodities can be classified to two types Hard and Soft commodities

- i. Hard Commodities:** Hard commodities consist of natural resources, such as metal ores, oil silver, steel, copper, iron, aluminum
- ii. Soft Commodities :** Soft commodities consist of products that must be grown and cared for, such as agricultural product, livestock, and related primary products.

There are about fifty major commodity markets worldwide trading in more than 100 commodities. Traders can trade in four major categories of commodities:

- i. Energy Commodities:** Energy goods used in households and industries are traded in bulk; such as oils, natural gas, and gasoline uranium, ethanol, coal, and electricity.
- ii. Metal Commodities:** A wide variety of metals like iron, copper, aluminium, and nickel, which are used in construction and manufacturing, are available for trading in the market, along with precious metals like gold, silver, and platinum.
- iii. Livestock and Meat Commodities:** such as pork bellies, live cattle, and feeder cattle.
- iv. Agricultural Commodities:** such as wheat, rice, cocoa, coffee, cotton, and sugar.

Globally, the most-traded commodities include gold, silver, crude oil, Brent oil, natural gas, soybean, cotton, wheat, corn, and coffee.

1.3. Types of Commodity Markets

Generally speaking, commodities trade either in spot markets or derivatives markets. Spot markets are also referred to as “physical markets” or “cash markets” where buyers and sellers exchange physical commodities for immediate delivery.

Derivatives markets involve forwards, futures, and options. Forwards and futures are derivatives contracts that use the spot market as the underlying asset. These are contracts that give the owner control of the underlying at some point in the future, for a price agreed upon today. Only when the contracts expire would physical delivery of the commodity or other asset take place, and often traders will roll over or close out their contracts in order to avoid making or taking delivery altogether. Forwards and futures are generically the same, except that forwards are customizable and trade over-the-counter (OTC), whereas futures are standardized and traded on exchanges. (Hayes, Commodity Market: Definition, Types, Example, and How It Works, 2021)

1.4. Examples of Commodities Markets

Some of the biggest commodity exchange markets in the world are the Chicago Board of Trade (CBOT), Chicago Mercantile Exchange (CME); New York Mercantile Exchange (NYMEX), London Metals Exchange (LME), Shanghai Futures Exchange (SHFE), and European Energy Exchange (EEE).

- **The Chicago Board of Trade (CBOT)** was established in Chicago in 1848. Commodities traded on the CBOT include corn, gold, silver, soybeans, wheat, oats, rice, and ethanol. (CME Group, 2023).
- **The Chicago Mercantile Exchange (CME):** trades commodities such as milk, butter, feeder cattle, cattle, pork bellies, lumber, and lean hogs. (CME Group, 2023)
- **The New York Mercantile Exchange (NYMEX):** trades commodities on its exchange such as oil, gold, silver, copper, aluminum, palladium, platinum, heating oil, propane, and electricity. (CME Group, 2023) Formerly known as the New York Board of Trade (CBOT), ICE Futures U.S. commodities include coffee, cocoa, orange juice, sugar, and ethanol trading on its exchange. (Intercontinental Exchange, 2023)
- **London Metal Exchange (LME):** LME participants can trade and take or make delivery of aluminium, copper, tin, nickel, zinc, lead, aluminium alloys and premiums. (HEX company, 2023)
- **Shanghai Futures Exchange (SHFE) :** The **Shanghai Futures Exchange** was formed from the integration of the national level future exchange of China, the Shanghai Metal Exchange, Shanghai Foodstuffs Commodity Exchange, and the Shanghai Commodity Exchange in December 1999. It currently trades future contract in copper, Aluminum, Zinc, Natural rubber, fuel oil and gold. (Wikipedia, n.d.)
- **European Energy Exchange (EEX):** The European Energy Exchange (EEX) is the leading energy exchange which builds secure, successful and sustainable commodity markets worldwide – together with its customers. As part of EEX Group, a group of companies serving international commodity markets, it offers contracts on Power, Natural Gas and Emission Allowances as well as Freight and Agricultural Products (EEX, n.d.).
- **Tokyo Commodity Exchange** are prominent international commodity exchanges: The term Tokyo Commodity Exchange (TOCOM) refers to a commodities futures exchange located in Tokyo. The exchange was founded in 1984 as a result of the merger between the Tokyo Textile Exchange, the Tokyo Rubber Exchange, and the Tokyo Gold Exchange (Tokyo Commodity Exchange, 2023). The exchange gives investors the opportunity to trade futures and option contracts for rubber, gold, silver, crude oil, gasoline, gas oil, kerosene, platinum, and palladium. Gold, crude oil, platinum, and rubber were the commodities with the highest trading volume in 2020. (Bloomberg, 2023)

2. Working Mechanisms of Commodity Trading

The commodity trading has undergone significant changes over the years. From direct exchange to electronic trading. In the past, trading mainly took place in physical markets where goods were physically exchanged i.e. transfer the goods from the seller's location to the buyer's required destination, this process was time-consuming and dependent on personal relationships. The process is improved (in term of cost and time) with the advent of brokers, traders could negotiate prices and complete transactions more efficiently; and the remarkable change came with the introduction of electronic trading. It has made the commodity market more accessible and efficient by eliminating the need for physical marketplaces. Traders can now access real-time market data and execute trades instantly. This is what we called the financial trading which involves the buying and selling of commodities on the exchanges to make gains or hedge against a price rise or fall. It does not involve any movement of goods. This has increased transparency and reduced the cost of trading. Additionally, electronic trading has also allowed for the development of complex financial instruments such as futures and options. These instruments allow traders to manage price risks and make more informed trading decisions.

2.1. Participants of commodity market

Investors participate in the commodity market in order to profit from fluctuating prices (if the markets move according to their expectations) these are called speculators; the other aims to hedge against the risk of price volatility, they are called hedgers.

i. Speculators:

The speculators are constantly analysing the prices of commodities as well as the factors that can influence these prices such as economics and political news as well as weather and exceptional events, to forecast future price movements. They are not willing to buy or sell the commodity but only buy or sell the derivatives contract of these commodities such as futures and options contracts (take a position by selling and buying the futures and options contracts). For instance, if the prediction is that the prices will move higher, they will buy commodity futures contracts and when the prices do actually seem to move higher, they can sell the aforementioned contracts at a higher price than what they bought it for. Similarly, if the predictions indicate a fall in prices, they sell

the contracts and buy them back at an even lower price, thus making profits. Since they are not interested in the actual production of goods or even taking delivery of their trades, they mostly invest through cash-settlement futures which provide them with substantial gains if the markets move according to their expectations. (AngelOne, 2020)

- ii. **Hedgers:** hedgers consists of the producers and consumers (consumers use these commodities as intermediary or raw material in their production process or buy these commodities for other purpose) typically hedge their risk (producers of commodities are exposed to the risk of price fall, the buyers or consumers of the commodities are faced the risk of price rise) with the help of the commodity futures market. For example, if prices fluctuate and fall during harvest, farmers will have to face a loss. To hedge the risk of this happening, farmers can take up a futures contract. So, when the prices fall in the local market, the farmers can compensate for the loss by making profits in the futures market. Inversely, if there is a loss in the futures market, it can be compensated for by making gains in the local market. (AngelOne, 2020)

2.2. How Commodity Markets Work

Commodities markets enable the producers and consumers of commodities to gain access to commodities trading in a centralized and liquid marketplace. These market actors can also use commodities derivatives to hedge future production or consumption against price fluctuations; and to speculate to make a profit from these fluctuation (Hayes, Commodity Market: Definition, Types, Example, and How It Works, 2021). In the past, commodities trading was primarily limited to professional traders. Today, there are more options for participating in the commodity markets (Hayes, Commodity Market: Definition, Types, Example, and How It Works, 2021).

In Spot markets, buyers and sellers exchange cash for immediate delivery of the physical product.

In derivatives markets, buyers and sellers exchange cash for the future delivery of that product. Oftentimes, derivatives holders will roll over or close out their positions before delivery can happen. Futures and options are the standardized and highly regulated derivative contract that are used on commodity exchanges, to hedge as well as to speculate.

i. What is a Commodity Futures Contract?

The Commodity Future contract are derivative contracts in which the traders agree to buy or sell a certain amount of of physical commodity at a pre-decided rate on a particular date in the future. Commodity futures are most often traded by commercial enterprises that depend on commodities for their business activities. For example, cereal company might buy wheat futures to secure prices, while an airline might purchase energy futures. Some sophisticated investors might also trade commodity futures, hoping to profit from changes in the price of a futures contract and never owning a contract when it comes due so they don't have to deal in the physical commodity.

When a trader purchases a futures contract, they are not required to pay the whole price of the commodity. Instead, they can pay a margin of the cost which is a predetermined percentage of the original market price. (AngelOne, 2020)

i. What are Options?

An option is a type of derivative contract that allows the buyer the right but not the obligation to purchase or sell an underlying asset. Commodity option works a little differently as unlike equities options, which give the holder the right to sell or purchase stock at predetermined prices; the commodity options provide the holder with the right to buy or sell underlying commodity futures at predetermined prices on the contract's expiration date. The option holder pays the seller of this right a price (known as the 'option premium') in exchange for possessing this right. When a buyer wants to exercise the option - then the seller (writer) of the option is responsible for fulfilling the contract.

- **The settlement in commodity market:** the modes of settlement in the commodity market for most options and futures contracts can be either cash settlement or physical delivery.

i. Cash Settlement

The cash settlement method of settling commodities does not involve the physical delivery of the asset(s) under consideration. It instead involves the settlement of net cash on the settlement date. Cash settlement involves the purchaser or the contract holder to pay the net cash amount on the

settlement date and execute the commodity settlement. The net cash amount is the difference between the spot price (SP) and the futures price (FP) of the underlying(s) (CFI team, 2023).

ii. Physical Delivery

The physical delivery method of settling commodities involves the literal physical delivery of the underlying asset(s) on the settlement date of the contract. The physical delivery settlement process is coordinated and settled via a clearing broker or a clearing agent. If the contract holder opts to take a short position, they are responsible for the physical delivery of the commodity. If the holder opts to take a long position, they will be taking, i.e., receiving physical delivery of the commodity. (CFI team, 2023)

Physical delivery involves a number of additional costs, including delivery costs, transportation costs, brokerage fees, and so on. Cash settlement is the more simple and convenient mode of settlement, as it only involves the upfront net cash amount as the total cost. Cash settlement is the most common settlement method for commodities because of its convenience, immediate commitment and the liquidity it brings to the market. That's why most financial derivatives - options and futures contracts are cash-settled.

Practice Questions

1. What are some general types of commodities?

- a. Cow, goats, and sheep
- b. Gold, diamonds, and emerald rings
- c. Consumer products, such as puzzles, music, and books
- d. Grain, livestock, energy

2. OTC derivatives are considered risky because _____.

- a. they are not settled on a clearing house
- b. they do not follow any formal rules or mechanisms
- c. here is no formal margining system
- d. all of the above

3. The first use of derivatives contract was _____.

- a. to manage price uncertainty
- b. for speculation
- c. for arbitrage
- d. None of the above

4. What is a commodity

- a. A commodity is a type of security that represents a piece of ownership in an organization.
- b. A commodity is a raw material or agricultural product in commerce that is interchangeable with other commodities.
- c. A commodity is a kind of derivative that gives you the chance to profit from price movements.
- d. A commodity is a global market that allows one currency to be exchanged for another.

5. Please, choose the right answer.

- a. A commodity market is a physical or virtual marketplace for buyers and sellers where they can trade any raw or primary products.
- b. The commodity market exists only in the physical marketplace and can't be virtually exchanged.
- c. A commodity is a kind of derivative that gives you the chance to profit from price movements.
- d. A commodity is a type of natural metal, found in the scopes of mountains in the south.

6. The commodity market has two main forms: Exchange Based Market and OTC Market. What does OTC stand for?

- a. Offshore Technology Conduct Market
- b. Official Trading Corps Market
- c. Over the Counter Market
- d. One Time Cost Market

- 7. A variety of commodities are traded all over the world. However, there are some major ones to consider. Pick ONE answer that does NOT represent a major commodity.**
- Gold and Silver
 - Crude Oil
 - Copper
 - Natural Gas
 - Coffee
 - Dairy
- 8. What moves prices in commodity markets?**
- Supply and Demand
 - Macroeconomic Performance
 - Politics
 - The behavior of Other Traders in the Market
 - All the above
 - None of the above
- 9. Participants of Commodity Market are_____?**
- Speculators
 - Hedger
 - Arbitrageur
 - Commodity producer
 - All the above
- 10. Cash settlement is the most common settlement method for commodities because of___?**
- its convenience,
 - Immediate commitment
 - liquidity it brings to the market
 - All the above

Answers

<i>Question number</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
<i>Answer</i>	<i>d</i>	<i>d</i>	<i>a</i>	<i>b</i>	<i>a</i>	<i>c</i>	<i>f</i>	<i>e</i>	<i>e</i>	<i>d</i>

**Chapter three:
Risk management in
commodity markets**

Risk is of different types and originate from different situations ; the risk represent the possibility of deviation from ordinaire situation which cause a loss. All risks originate due to the uncertainty arising out of various factors that influence an investment or a situation. The commodity risk is the possibility of the price fluctuation which cause a loss for their producers or consumer. Price fluctuations on a raw material can be caused by a variety of things, depending on the raw material in question, and also where the raw material is being sourced from. There are different commodity risk management strategies, some of which are for producers and others for consumers, and there are strategies that can be followed by both consumers and producers.

1. What is commodity risk?

1.1. Definition of commodity risk

Commodity risk is the possibility that commodity price change will cause losses for either commodity buyers or producers (Hayes, 2022)

- ❖ **For commodity’ producers**, they are exposed to unexpected price fall, a decrease in commodity prices is going to cause a loss, because they’re going to receive less money for the raw material that they’re providing. For example, if the United State Department of energy announce a plan to release its oil strategic reserve, then Oil price will drop and the petroleum companies will incur losses. The French oil company Total SA, stated that its net operating income would fall by \$2 billion if the price of a barrel of oil decreased by \$10. Similarly, their operating cash flow would drop by \$2 billion when the oil price dropped by \$10 (Securities and Exchange Commission U.S., 2015). From June 2014 to January 2016, oil prices fell by over \$70 per barrel. This price move should have reduced Total's operating cash flow by about \$17 billion during that period (Stocker, Baffesdana, & Vorisek, 2018).
- ❖ **For commodity’ buyers**, they are exposed to unexpected price rise, an increase in the commodity price causes a loss for the companies who rely on raw materials to produce their products because they’re going to pay more than they had expected to pay to obtain the raw material they need. For example, many clothing manufacturers must buy Cotton, so higher cotton prices increase the cost of making cloths and negatively impact clothing makers' profit margins. The automobile manufacturers face commodity price risk because they use commodities like steel and rubber to produce cars, the price increase in these commodities can reduce the manufacturers profit margin.

1.2. Sectors exposed to the commodities risk

Like mentioned above that the commodity price risk can affect the producer of the commodity and their consumers.

First- Commodity Producers: are exposed to price falls, which means they receive less revenue for commodities they produce. for example

- Mining and Minerals sector like Gold, steel, coal, etc
- The agricultural sector like wheat, cotton, sugar, etc
- Energy sectors like Oil, Gas, Electricity, etc

Second- Consumers of commodities like Airlines, Transport companies, Clothing, and food manufacturers are primarily exposed to rising prices of raw material, increasing the cost of product they produce.

1.3. Factors cause commodity risk

Commodity price fluctuations can be caused by a variety of factors, depending on the raw material in question, and also where the raw material is being sourced from. Factors that can influence commodity prices include politics, seasons, weather and technology (Hayes, 2022).

First- Political Factors

Political factors can raise the price of some commodities while reducing the price of others. In 2018, Trump Administration imposed tariffs on steel and aluminum imported from foreign countries. This decision was caused steel and aluminum prices rise in the United States relative to the rest of the world. (Congressional Research Service, 2021)

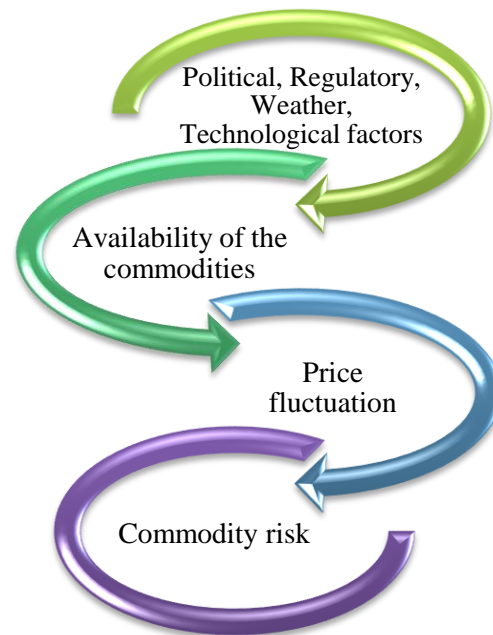
Second- Weather

Weather fluctuations or the seasonal may have a substantial impact on commodity prices. The end of summer brings with it plentiful harvests, so commodity prices tend to fall. Soybean prices likely will be very sensitive to spring and summer weather forecasts. If drought conditions spread and more key productions regions are impacted, this can also lead to temporary increases in the prices of soybean. (North Dakota State University, 2021)

Third- Technology

Technology can have a dramatic influence on commodity prices. Aluminum was considered a precious metal until procedures for isolating it improved during the 19th and 20th centuries. As technology advanced, aluminum prices collapsed (Gayle & Look, 1980).

Figure 5: factors of commodity price fluctuations



Source: researcher' elaboration based on the previous information

1.4. Types of risks

As we explained previously, commodity risks have many causes, including political, weather, economic and regulatory. These risks can be classified according to their causes into: price risk, quantity risk, and regulatory risk. (Vaidya, 2018)

First- Price risk: are the risk arises from an adverse movement in the price of a commodity as caused by the macroeconomic factors such as interest rate, inflation, exchange rate.....Let's take oil as example of commodity a decrease in interest rate (especially federal funds rate) lead to oil price hike; according to this theory when interest rates drop, consumers and companies are able to borrow and spend money more freely, which drives up demand for oil, this ultimately pushes up the oil prices.

The relationship between oil and the exchange rate (taking the value of the US dollar as a reference) is often negative, which means that a strengthening dollar generally leads to lower oil prices and vice versa. This is because of the so-called petrodollar system, which originated in the late 1970s when the United States and Saudi Arabia decided to adopt the US dollar for oil transactions (countries that import oil pay in USD, while those who export oil receive payment

in dollars). When the value of the US dollar drops, it becomes relatively more affordable to buy oil, which in turn pushes up crude prices.

Second- Quantity risks: This risk arises due to changes in the availability of commodities. For example, due to the flood which ruined the agricultural crops, there was a fluctuation in the availability of various agricultural products such as wheat, cotton or corn.....

Third- Regulatory Risk: Arises due to changes in laws and regulations, which impact the availability and the prices of commodities. For example, if the organization of the petroleum countries (OPEC) decide in it's meeting to cut the oil production the oil price will rise, because the OPEC controls almost 80% of the world's supply of oil reserves. The consortium sets production levels to meet global demand and can influence the price of oil and gas by increasing or decreasing production.

2. Commodity risk Management

Risk management means recognizing the dangers that come with every investment and choosing to be protected from any untoward event that can impact one's finances that may lead to loss of value. However, managing the risks doesn't necessarily mean that the investments won't lose value at all. Rather the losses will be mitigated by gains in another investment. Now we will discuss the risk management strategies from two angles (Vaidya, 2018)

- Producers of commodities
- Buyers of commodities

2.1. Commodity Risk Management Strategies for Producers (Vaidya, 2018)

i. Diversification: this strategy consist in rotating the production through different products, the success of this strategy require to ensure that alternative products don't be subject to the same price risk.

Diversification example: it is preferable to produce several products or a range of products to protect against price volatility, for example rotation of crops to produce different products can reduce efficiently the large loss from price volatility.

ii. Flexibility: flexibility means change in its production method or change in the production mix this in line with market conditions or events that may hurt business.

Flexibility Example: A steel company in a falling prices scenario may, instead of producing steel using coal, use low-cost pulverized coal, which has the same effect but at a lower cost. This flexibility has the effect of improving financial performance. (Vaidya, 2018)

iii. Price pooling arrangement: this strategy consists of an arrangement to sell the commodity to the cooperative or marketing board at a determined price based on several factors.

iv. Storing: to face price drop due to the increased in the production, the producers may store the production till a favorable price is obtained (until prices rebound). However, when considering this strategy, the producers must take into account the storage cost, insurance and spoilage costs.

v. Production contracts: to avoid price uncertainty (risk of price drop) the producer may enter a production contract with the buyer in which he predetermines the quality, price and quantity of the product.

2.2. Commodity Risk Management Strategies for Buyers (Vaidya, 2018)

Like the producer of the commodities, the consumers or the buyers of the commodities adopt strategies to avoid or for managing commodity price risk.

i. Supplier Negotiation: in this strategy the buyer makes an arrangement with the suppliers for an alternative pricing plan. For example, reduce the price in exchange for an increase in the quantity purchased.

ii. Alternative sourcing: in this strategy the buyer choose an alternative commodity from the same or different producers that can give the same result in the production process, or look for an alternative supplier who give the same commodity at lower price.

iii. Production process review: according to this strategy, the buyer usually and regularly reviews the use of commodities in the production process in attempt to change the mix of products to replace the overpriced commodities.

Example: Manufacturers of food products continuously look for improvements in a product using less higher-priced or more volatile inputs such as sugar or wheat. (Vaidya, 2018)

2.3. Financial Market Instruments to Manage the Commodity Risk

One of the most effective ways to manage risk in commodity trading is to use hedging strategies. Hedging involves taking offsetting positions in the Financial market to reduce exposure to price movements. By using hedging, traders can protect themselves against potential losses due to price volatility. Futures and options contracts are two financial instruments commonly used to hedge

against commodity price risk in commodity market. These contracts can benefit commodity buyers and producers by reducing price uncertainty. In the other hand, there is also forward contracts which are used in Over-the-Counter market to lock in a specific price and avoid price volatility.

i. Forward contracts: is contract between two parties to buy or sell an asset at a specified future time at a price agreed upon today. In this case, the risk of price changes is avoided by locking the prices (McDonald, 2012).

Forward Contract Example: on October 1st 2022 Company “A” and Company “B”, entered a contract whereby company “A” sold 1000 tons of wheat to company “B” at 100\$/tons on January 1st 2023.

According to the contract, whatever the price on January 1st 2023, “A” has to sell “B” 1000 tons at 100\$/tons.

ii. Futures contract: Futures contracts are the most commonly used type of hedge in commodity trading. They involve entering into an agreement to buy or sell a commodity at a fixed price at a specified future date. This allows traders to lock in a price for their commodity, thereby reducing their exposure to price movements. Futures contracts are standardized contracts, meaning they are traded on the exchange market (KOLB & Overdahl , 2006)

In the trading of futures contracts, an investor can take two types of positions: long and short. An investor can either buy future contract (going long) or sell it (going short) (CFI Team, 2023). In other words, the buyer of a contract is said to be a long position holder, and the selling party is said to be a short position holder. As both parties risk their counterparty walking away if the price goes against them, the contract may involve both parties lodging a margin (initial margin¹) of the value of the contract with a mutually trusted third party (clearing house²). In the futures markets, a trader has two basic choices: buy or sell.

¹ **Initial margin:** is the amount required by the exchange to initiate a futures position. **Maintenance margin:** is the amount of money a trader must have on deposit in their account to continue holding their position, which is typically 50% to 75% of the initial margin.

² **Clearing house** is a financial institution formed to facilitate the exchange (i.e., clearance) of payments, securities, or derivatives transactions.

- When investors buy a futures contract, means they are “**going long**” or they take “**long position**” in the market when they fear rising prices. Traders take this position when they plan to buy an underlying asset in the future and want to hedge against risk if price rise. Traders can use sell orders to offset buy orders and exit open long positions.
- When investors sell a futures contract, means they are “**going short**” or they take “**short position**” in the market when they fear prices drop. Traders take this position when they plan to sell an underlying asset in the future and want to hedge against risk if price fall. Traders can use buy orders to offset sell orders and exit open short positions. A short position is the exact opposite of a long position.

Future example: In October, an investor **plans to sell** 3,000 barrels of oil in December, and he is not sure about the future price of oil and wants to hedge against prices fluctuation. The price of a barrel in the spot market in October is \$67 per barrel, and oil futures contracts for the month of December are traded at \$70 per barrel. Let’s assume initial margin is 6% and the maintenance margin is 75%. Knowing that the size³ of oil future contract is 1000 barrel/contract, how many futures contracts should the investor enter into to hedge against the risk? Calculate the initial margin and maintenance margin? What position should the investor take to cover the risk of price fluctuation in the future? If the price in December is \$79/barrel or \$60/barrel, what is the net purchase price, in each case?

1. The number of future contract that the investor should purchase is $3000/1000 = 3$ Contracts
2. Calculate the initial margin and maintenance margin:
 - first the future contract value = $3000 \times 70 = 210000\$$;
 - then the initial margin is $0.06 \times 210000 = 12600\$$;
 - the maintenance margin is $12600 \times 0.75 = 9450\$$.
3. The investor must take a short position (sell December future contract) to cover the risk of price fall in December. In December at the delivery date the investor can use buy (at the December spot price) orders to offset sell orders and exit open short positions.

³ *Size:* is the quantity of the product delivered for a single contract, also known as contract size. For example: 5,000 bushels of corn, 1,000 barrels of crude oil are all contract sizes as defined in the futures contract specification.

4. The net selling price in each case:

Scenario 1: price increase: In December, the price of oil in the spot market reached \$79 per barrel. The investor delivers 3,000 barrels and gets \$79 for each barrel. However, by entering into a futures contract, he losses 9\$ by closing his short position (buy a future contract) at 79\$.

Spot Market	Futures Market
October: price of Oil is 67\$/barrel	October: sell an Oil futures contract at 70\$/barrel
December: sell Oil at 79\$/barrel	December: close the position by buying the futures contract at 79\$/bushel
	Incurs a loss of (70-79=9\$)

- A barrel of oil was sold in December at a price of79\$
- Loss from the futures contract position -9\$
- **The net selling price70\$**

Scenario 2: price decrease: In December, the price of oil in the spot market reached \$60 per barrel. The investor delivers 3,000 barrels and gets \$60/barrel. By entering into a future contract, he earns 10\$ by closing his short position (buy a future contract) at 60\$.

Spot Market	Futures Market
October: price of Oil is 67\$/barrel	October: sell an Oil futures contract at 70\$/barrel
December: sell oil at 60\$/barrel	December: close the position by buying the futures contract at 60\$/bushel
	Make profit of (70-60=10\$)

The net purchase price is:

- A barrel of oil was sold in December at a price of 60\$
- Profit from the futures contract position 10\$
- **The net selling price70\$**

iii. Commodity options:

Options are another type of hedge that can be used in commodity trading. They give traders the right, but not the obligation, to buy or sell an underlying asset (commodity futures contract) at a specified price (KOLB & Overdahl , 2006).

This allows traders to limit their potential losses from price movements. In the case of commodity options, a company purchases or sells the commodity under an agreement that gives the right and not the obligation to undertake a transaction at an agreed future date. An option is a derivative contract that gives the buyer the right, but not the obligation, to buy or sell the underlying asset by a certain date (expiration date) at a specified price (strike price). There are two types of options: calls and puts. American-style options can be exercised at any time prior to their expiration. European-style options can only be exercised on the expiration date (Loo, 2023). A long call position is one where an investor purchases a call option. Thus, a long call also benefits from a rise in the underlying asset's price. A long put position involves the purchase of a put option, Thus, a long put benefits from a decrease in the underlying asset's price. ⁴

Commodity Options example: Investor “A” buy a call option at 2\$/barrel (premium) to buy Crude oil futures contract 1000 barrels of oil at 95\$/barrel (strike price), the delivery date in 07-17-2022.

This means that, on July 17, 2022, the call option holder has the right to buy WTI crude oil futures for a strike price of \$95.

- If on July 17, 2022, the market price of WTI crude oil futures is \$100, the option holder could exercise the option and buy WTI crude oil futures for \$95 instead of the true market value of \$100; then, close the futures position immediately (then offsetting the futures position by selling futures) to make a profit of \$5 ($\$100 - \95) per barrel.
- Alternatively, if on July 17, 2022, the market price of WTI crude oil futures was less than \$95, for example 80\$ the contract would expire worthless and the call option holder would not exercise the call option contract.

⁴ You find further explanation about options contracts in the following chapter (chapter 4)

Practice Questions

Exercise 1: choose the right answer

1. Commodity risk is the possibility that commodity price changes will cause financial losses for ?
 - Commodity Buyers
 - Commodity Producers
 - Commodity Market
 - Either Commodity Buyers or Producers
2. Diversification is one of the commodity risk management strategies for?
 - Commodity Producers
 - Commodity buyers
 - Both producers and buyers
3. Which of these strategies is the producers' commodity risk management strategy?
 - Pooling price arrangement
 - Suppliers Negotiations
 - Forward contract
4. The futures contract could be used by producer and buyers of commodity to hedge against price fluctuation?
 - False
 - True
5. Someone that plans to sell corn in next three months to hedge he has to take?
 - Long position
 - Short position
 - None of the above

On January 2023, company A and company B entered into a forward contract, whereby company B has to sold 50,000 bushels of Corn to Company A at \$7/bushel and delivery on March 25, 2023.

6. On the date of delivery if the price is \$15/bushel then;
 - The company B makes profit.
 - The company A incurs a loss.
 - Both companies didn't make neither profit nor loss.
 - None of the above
7. On the date of delivery if the price is \$7/bushel then;
 - The company A makes profit.

- The company B incurs a loss.
 - Both companies didn't make neither profit nor loss.
8. On the date of delivery if the price is \$5/bushel then;
- The company A makes profit of 100000\$.
 - The company B incurs a loss 50000\$.
 - The company B makes a profit of 100000\$.
 - None of the above.

Exercise 2:

- I. On November 2022, company A and company B entered into a forward contract, whereby company A has to sold 100,000 bushels of wheat to Company B at \$10/bushel and delivery on February 20, 2023. On the date of delivery if the price is \$15/bushel, \$10/bushel, 6 \$/ per bushel. Did the company A make profit or loss in each case?
- II. In March, an investor plans to buy **15,000 bushels** of corn in July to cover his future needs of this commodity. He is unsure about the future price of corn and wants to hedge against price fluctuation. The current market price of corn **in March is \$6.8/bushel**, and corn **futures contracts for July are trading at \$6.89/bushel**. Assume that the **size of the corn futures contract is 5000 bushels** and that the **initial margin is 6%** and **the maintenance margin is 80%**, how many futures contracts should the investor enter into to cover his future needs? Calculate the initial margin and maintenance margin? What position should the investor take to cover the risk of price fluctuation in the future? If the price in July is \$7/bushel or \$6/bushel, show the position of the investor in each case? What is the net purchase price, in each case?
- III. In February, an investor plans to sell **20,000 bushels** of Wheat in June; He is unsure about the future price of Wheat and wants to hedge against price fluctuation. The current market price of wheat **in February is \$10.5/bushel**, and Wheat **futures contracts for June are trading at \$11/bushel**. Assume that the **size of the Wheat futures contract is 5000 bushels** and that the **initial margin is 5%** and **the maintenance margin is 75%**.
1. The number of futures contracts should the investor enter into?

- Five
 - Three
 - None of the above
 - Explanation.....???
2. The initial margin and maintenance margin?
- The initial margin is 8250 the Maintenance margin is 11000.
 - The initial margin is 11000 the Maintenance margin is 5280.
 - The initial margin is 11000 the Maintenance margin is 8250.
 - Explanation.....???
3. What position should the investor take to cover the risk of price fluctuation in the future?
- Long position
 - Short Position
4. If the spot price in June is \$7/bushel, the net selling price is;
- 10\$
 - 11\$
 - 11.7\$
5. If the spot price in June is \$15/bushel, the net selling price is;
- 15\$
 - 11\$
 - 10\$

Explanation.....???

Answers

Answers of the exercise 1

1. Commodity risk is the possibility that commodity price changes will cause financial losses for ?
 - **Either Commodity Buyers or Producers**
2. Diversification is one of the commodity risk management strategies for?
 - **Commodity Producers**
3. Which of these strategies is the producers' commodity risk management strategy?
 - **Pooling price arrangement**

- **Forward contract**
4. The futures contract could be used by producer and buyers of commodity to hedge against price fluctuation?
 - **True**
 5. Someone that plans to sell corn in next three months to hedge he has to take?
 - **Short position**
 6. On the date of delivery if the price is \$15/bushel then;
 - **None of the above**
 7. On the date of delivery if the price is \$7/bushel then;
 - **Both companies didn't make neither profit nor loss.**
 8. On the date of delivery if the price is \$5/bushel then;
 - **The company B makes a profit of 100000\$.**

Answers of the exercise 2

I. First if the spot price is 10\$/bushel, then, the parties of the contract did not achieve neither profit nor loss; (the spot price is the same as the agreed price in the forward contract).

Second, the spot price is 15\$/bushel, then the company A incurs loss (the agreed price in the forward contract is lower than the spot price on the date of execution) of 500000\$, $100000(10-15) = 500000$ \$. The company B makes a profit (avoid extra cost by entering into a forward contract) of 500000\$.

Third case, the spot price is 6\$/bushel, then the company A makes profit (the agreed price in the forward contract is higher than the spot price on the date of execution) of 400000\$, $100000(10-6) = 400000$ \$. The company B incurs a loss of 400000\$.

II. - The number of futures contract that the investor should purchase is $15000/5000 = 3$

Contracts

- Calculate the initial margin and maintenance margin:

first the futures contract value = $15000 \times 6.89 = 103350$;

then the initial margin is $0.06 \times 103350 = 6201$;

the maintenance margin is $6201 \times 0.8 = 4960.4$.

- The investor must take a long position (buy a July future contract) to cover the risk of price increase in July.

- If the price in July is \$7/bushel the position of the investor is as follow:

Spot Market	Futures Market
March: price of corn is 6.8\$/bushel	March: Buy a futures contract at 6.89\$/bushel
July: purchase a corn at 7\$/bushel	July: close the position by selling the futures contract at 7\$/bushel
	Make a profit of $(7-6.89=0.11)$

The net purchase price is:

- A bushel of corn was purchased in July at a price of7\$
- Make a profit on the futures contract position 0.11\$
- The net purchasing price6.89\$

If the price in July is \$6/bushel the position of the investor is as follow:

Spot Market	Futures Market
March: price of corn is 6.8\$/bushel	March: Buy a futures contract at 6.89\$/bushel
July: purchase a corn at 6\$/bushel	July: close the position by selling the futures contract at 6 \$/bushel
	Incur a loss $(6-6.89= - 0.89)$

The net purchase price is:

- A bushel of corn was purchased in July at a price of6\$
- Incur a loss on the futures contract position 0.89\$
- The net purchasing price6.89\$

III. The number of futures contracts should the investor enter into?

- None of the above

Explanation: Number of the futures contracts should the investor enter into = $20000/5000 = 4$

- The initial margin and maintenance margin?

- The initial margin is 11000 the Maintenance margin is 8250.

Explanation: The futures contract value = $20000 \times 11 = 220000$;

then the initial margin is $0.05 \times 220000 = \mathbf{11000}$;

the maintenance margin is $11000 \times 0.75 = \mathbf{8250}$.

- What position should the investor take to cover the risk of price fluctuation in the future?
- Short Position because he has to sell a futures contract to hedge against price fall

- If the spot price in June is \$7/bushel, the net selling price is;
 - 11\$
- If the spot price in June is \$15/bushel, the net selling price is;
 - 11\$

Explanation: First scenario Spot price in June is 7\$/bushel

Spot Market	Futures Market
February: price of Wheat is 10.5\$/bushel	February: Sell a futures contract at 11\$/bushel
June: Sell a Wheat at 7\$/bushel	June: close the position by buying the futures contract at 7\$/bushel
	Make a profit of (11 - 7 = 4)

The net selling price is:

- A bushel of Wheat was sold in June at a price of7\$
- Make a profit on the futures contract position 4\$
- **The net selling price11\$**

Scenario two: Spot price in June is 15\$/bushel

Spot Market	Futures Market
February: price of Wheat is 10.5\$/bushel	February: Sell a futures contract at 11\$/bushel
June: Sell a Wheat at 15\$/bushel	June: close the position by buying the futures contract at 15\$/bushel
	Loss of (11 - 15 = -4)

The net selling price is:

- A bushel of Wheat was sold in June at a price of15\$
- incurs a loss on the futures contract position -4\$
- **The net selling price11\$**

**Chapter four:
Applications of forwards
and options in the
commodity markets**

The basic derivatives contracts forward and options contracts are widely used in commodities market, these fundamental derivative instrument can be used for various purposes; However, the main purpose is to hedge against potential losses. As it enables the participant to lock in price in the future, this guaranteed price can be very important, especially in industries that commonly experience significant volatility in prices. In the following, we explain how the contracts work and introduce an extremely important tool for analyzing derivatives positions—namely, payoff and profit diagrams.

1. Forward Contract

1.1. Definition of Forward contract

Forward contract: it sets today the terms at which you buy or sell an asset or commodity at a specific time in the future. A forward contract does the following:

- Specifies the quantity and exact type of the asset or commodity the seller must deliver.
- Specifies delivery logistics, such as time, date, and place.
- Specifies the price the buyer will pay at the time of delivery.
- Obligates the seller to sell and the buyer to buy, subject to the above specifications.

The time at which the contract settles is called **the expiration date (or maturity date)**. The asset or commodity on which the forward contract is based is called the **underlying asset**. The contractual forward price simply represents the price at which consenting adults agree today to transact in the future, at which time the buyer pays the seller the forward price and the seller delivers the asset (McDonald, 2012).

1.2. Difference between the forwards and futures contract

Forward contracts are similar to futures contracts in that they create an obligation to buy or sell at a predetermined price at a future date (McDonald, 2012). The institutional and pricing differences between forwards and futures are summarized in the following table

Table 01: Key differences between Forward & Futures contracts

Basis for Comparison	Forward contract	Futures contract
What is it?	It is a tailor made contract.	It is a standardized contract.
Traded on	Over the counter, i.e. there is no secondary market.	Organized stock exchange.
Settlement	On maturity date.	On a daily basis.
Risk	High	Low
Default	As they are private agreement, the chances of default are relatively high.	No such probability.
Size of contract	Depends on the contract terms.	Fixed
Collateral	Not required	Initial margin required.
Maturity	As per the terms of contract.	Predetermined date
Regulation	Self regulated	By stock exchange
Liquidity	Low	High

Source: (Surbhi, 2017) <https://keydifferences.com/difference-between-forward-and-futures-contract.html>

1.3. How Forward contract works

As mentioned before, Forward contracts are mainly used to hedge against potential losses. They enable the parties to determine the price at which they buy and sell in the future. For example, in the agricultural sector, entering into a forward contract to sell a specific quantity of crops (wheat) can help to protect against potential downward swings in wheat prices.

Every forward contract has both a party agreeing to buy and one agreeing to sell. The term long is used to describe the buyer and short is used to describe the seller. generally, a **long** position is one that makes money when the price goes up and a short is one that makes money when the price goes down (McDonald, 2012).

Because the long has agreed to buy at the fixed forward price, a long position profits if prices rise. The **payoff** to a contract is the value of the position at expiration. The payoff to a long forward contract is (McDonald, 2012):

$$\text{Payoff to long forward} = \text{Spot price at expiration} - \text{forward price} \quad (1)$$

Because the short has agreed to sell at the fixed forward price, the short profits if prices fall.

The payoff to a short forward contract is (McDonald, 2012) :

$$\text{Payoff to short forward} = \text{Forward price} - \text{spot price at expiration} \quad (2)$$

To illustrate these calculations, consider a forward contract on a oil.

Forward Contract Example: Company “A” and Company “B” on October 1st 2022, entered a contract whereby company “A” sold 1000 barrels of oil to company “B” at 80\$/barrel the delivery on January 5th 2023.

According to the contract, whatever the price on January 5th 2023, “A” has to sell “B” 1000 barrels of oil at 80\$/barrel.

If the spot price on the delivery date is \$80/barrel

If the spot price on the delivery date is \$95/barrel

If the spot price on the delivery date is \$72/barrel

What is the payoff for each party in each case?

From the above the company **A** agreeing to sell, so, A is seller (**Short**); and **B** agreeing to buy means B is buyer (**Long**). Following the equation 1 & 2 we can calculate the payoff for the two parties in each case as follow:

First- if the spot price is 80\$/barrel, then, the parties of the contract did not achieve neither profit nor loss. *Payoff to long forward (B) = 0, Payoff to short forward (A) = 0*

Second- if the spot price is 95\$/barrel, then, *payoff to short forward (A) = 80-95 = -15\$/barrel*, means A incurs a loss of $1000(-15) = 15000\$$.

Payoff to long forward (B) = 95 - 80 = 15 \$/barrel, means the company B make a profit (avoid extra cost by entering into a forward contract) of 15000\$.

Third- if the price is 70\$/barrel, *payoff to short forward (A) = 80-70 = 10 \$/barrel*, means A makes a profit of $1000(10) = 10000\$$.

Payoff to long forward (B) = 70 - 80 = -10 \$/barrel, means the company B incurs a loss of 10000\$.

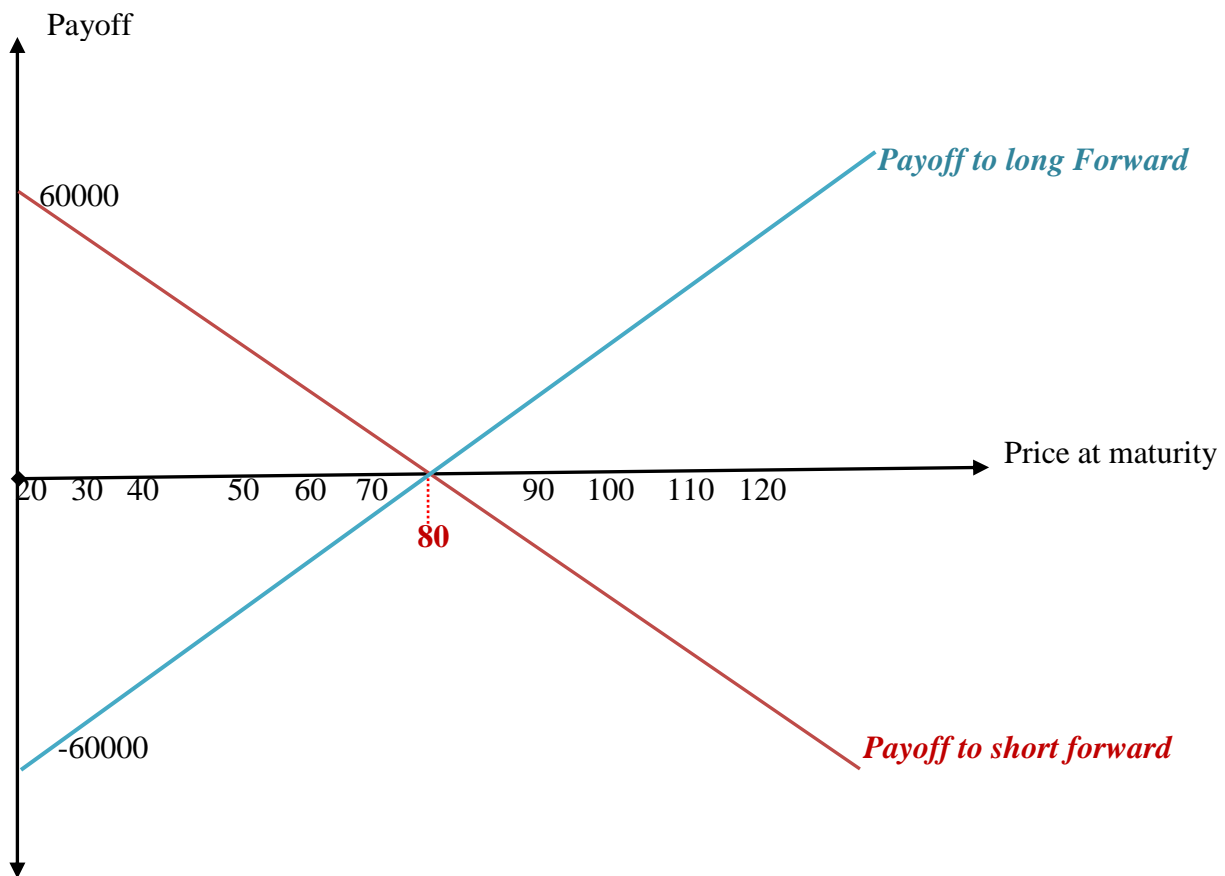
This example illustrates the mechanics of a forward contract, showing why the long makes money when the price rises and the short makes money when the price falls.

The problem arises if one of the parties fails to perform: As the trader may not accept to sell if oil price rise significantly like for example \$140/barrel in January 2023. On the other hand, if the buyer goes bankrupt or if January 2023 oil’ price drops to \$50/barrel, there is an incentive to default.

Graphing the Payoff on a Forward Contract : let us now look at what the payoff diagram of a forward contract is, based on the price of the underlying asset at maturity: We can graph the information of the previous example to show the payoff on the forward contract ; graphs the long

and short positions, with the oil price at the expiration of the forward contract on the horizontal axis and payoff on the vertical axis. As you would expect, the two positions have a zero payoff when the spot price on the expiration date equals the forward price of \$80. The graph for the short forward is a mirror image (about the x-axis) of the graph for the long forward. For a given value oil spot price, the payoff to the short is exactly the opposite of the payoff to the long. In other words, the gain to one party is the loss to the other.

Figure 6: Long and short forward positions



Source: Researcher elaboration

From the graph, we can see what the payoff would be for both long and short where 80 is the agreed-upon price of the underlying asset, specified in the contract. The higher the price of the oil at maturity, the greater the payoff for the long. A price below 80 at maturity, however, would mean a loss for the long. The forward short has the exact opposite payoff.

2. Options contract

As mentioned in previous section, a forward contract obligates the buyer (the holder of the long position) to pay the forward price at expiration, even if the value of the underlying asset at expiration is less than the forward price; and the seller (the holder of short position) to sell at forward price, even the price of the underlying asset at expiration is higher than the forward price. Because losses are possible with a forward contract, it is natural to wonder: Could there be a contract where the buyer and seller of the underlying asset has the right to walk away from the deal? The answer is yes; Option is a contract where the holder has the right to buy or sell, but not the obligation to buy or sell an underlying asset.

2.1. Definition

Option contract give the buyer the right but not the obligation: to buy (call option) or to sell (put option); an agreed amount of a specified financial asset, called the **underlying**; at a specified price, called the **exercise or strike price**; on or by a specified future date, called **the expiry date** (Chisholm, 2010).

2.2. Some Important Terminologies in Options Contracts

In the following some key terms used to describe options (McDonald, 2012):

- **Strike price or exercise price**, of a call option is what the buyer pays for the asset. The strike price of put option is at what the seller agrees to sell the asset. In other words, the strike price is the price at which the holder of the option can exercise the option to buy or sell an underlying asset.

For example, if you choose a soybean option with a strike price of \$12 per bushel, means you have the right to buy or sell soybean futures for \$12. This will occur whatever the current level of soybean futures price (Hofstrand, 2022). Strike prices are listed at predetermined price levels for each commodity: every 25 cents for soybeans, and 10 cents for corn..... For example, if the July corn futures price is \$5, there will be corn options introduced with strike prices of \$4.80, \$4.90, \$5.00, \$5.10, and \$5.20. (Hofstrand, 2022)

- **Exercise.** The exercise of a call option is the act of paying the strike price to receive the asset. The exercise of put option is the act of selling the asset and receive the strike price.
- **Expiration.** The expiration of the option is the date by which the option must either be exercised or it becomes worthless. On the date of expiration, the option contract is settled between the buyer and seller. Options expire in the month prior to contract delivery. For example, a July corn option expires in June
- **Premium:** is the price paid by the buyer of the contract to obtain the option, also called the option price, is non-refundable whatever the future changes.
- **The underlying asset:** is the future contract on a specific commodity.
- **Intrinsic value:** represents the difference between the current price of the underlying security and the option's exercise price, or strike price. Essentially, intrinsic value exists if the strike price is below the current market price in regard to calls and above for puts. Only in-the-money options have intrinsic value (Merrill Bank of America Company, 2022).

$$\text{Intrinsic value (calls)} = \text{current asset price} - \text{strike price}$$

$$\text{Intrinsic value (put)} = \text{strike price} - \text{current asset price}$$

2.3. Types of options contracts: Options can be divided into several types as follows:

I. American-style options and European-style options

- **European-style options** can only be exercised on the expiration date.
- **American-style options** can be exercised at any time prior to their expiration.

II. Calls and puts option

- **Call option** gives the holder the right to buy an underlying asset by a certain date at a fixed price (Chisholm, 2010). Investors buy calls when they believe the price of the underlying asset will increase and sell calls if they believe that the prices will decrease.
- **Put option** conveys the right to sell an underlying asset by a certain date at a fixed price. As noted above, the purchaser of an option has to pay an initial fee called a premium (Chisholm, 2010). Investors buy Puts when they believe the price of the underlying asset will decrease and sell puts if they believe it will increase.

III. The Out-, At-, and In- the Money option (Chisholm, 2010)

- **At-the-money (ATM)**, an option is considered at the money when the strike price equals to the price of the underlying futures. The option is said to be at-the-money. This means that the strike

price and the current or cash market underlying futures price are exactly the same. An at-the-money option has zero intrinsic value.

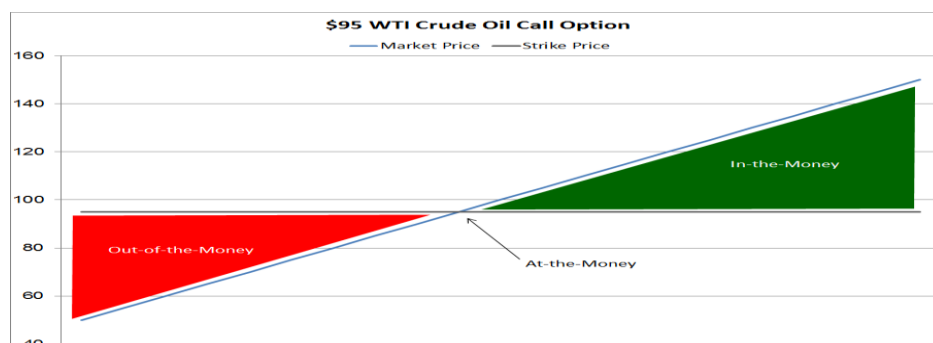
- **In-the-money (ITM) option**, an option is considered ITM when the price of the underlying future is above the strike price of a call option; or when the price of the underlying is below the strike price of a put option.
- **Out-of-the-money (OTM)**, an option is considered OTM when the price of the underlying future is below the strike price of a call option; or when the price of the underlying futures is below the strike price of a put option.
- **For example**, if you buy a soybean option (Call or Option) with a strike price of \$12 per bushel, means you have the right to buy (Call) or sell (Put) soybean futures for \$12. This will occur whatever the current level of soybean futures(underlying asset) price. the following table indicate the state of your position according to the current (in the expiration date) price of the soybean futures contract.

Table 2: the In-, At- and Out- the- Money (call, put) Option

Option	Strike price	Current underlying asset price	In, At or Out of the Money
Call	12	12	At-the-money
Call	12	20	In-the-money
Call	12	7	Out-the-money
Put	12	12	At-the-money
Put	12	25	Out-the-money
Put	12	7	In-the-money

Source: researcher 'elaboration

Figure 7: In-, At- and Out-the money WTI crude Oil call option with strike price 95\$/barrel



Source: (Mercatus Energy Advisor) <https://www.mercatusenergy.com/blog/bid/89897/a-beginner-s-guide-to-crude-oil-options-part-i-strike-price>

2.4. How options contract work?

First-The basic option trading strategies: in this section present the four basic option trading strategies (Chisholm, 2010):

- **Long call:** means buy the call (right to buy underlying asset) at strike price.
- **Short call:** means sell the call (obligated to sell or deliver the underlying asset) at strike price.
- **Long put:** means buy the put (right to sell the underlying asset) at a strike price.
- **Short put:** means sell the put (Obligated to take delivery of the underlying asset) at strike price.

In the commodity market, the underlying asset for the option contract is the futures contract, so, if a trader buys oil Call option, this means that at the expiration date, he has the right to buy the oil futures contract at the strike price and thus, the trader' position in option contract devolve to position in futures contract. The different position in the call and put option devolve to positions on futures contract as follow:

- If a trader possesses a long call option in a commodity, upon expiry, if he exercises the options its position will devolve into a long position in the futures contract.
- If trader possesses a short call option in a commodity, upon expiry, if he exercises the options its position will devolve into a short position in the futures contract.
- If trader possesses a long put option in a commodity, upon expiry, if he exercises the options its position will devolve into a short position in the futures contract.
- If trader possesses a short put option in a commodity, upon expiry, if he exercises the options its position will devolve into a long position in the futures contract.

Table 3: option positions

Option Position	After exercise of respective options
Long call option	Long futures
Short call option	Short futures
Long put option	Short futures
Short put option	Long futures

Source : Researcher' elaboration

Second- Option Payoff and profit: The option payoff is the difference between the strike price and the current price at the date of the exercise of the respective options; the payoff of the option position can be calculated using the following formula (McDonald, 2012):

Payoff from long call = ((spot price - strike price))

Payoff from short call = (- (spot price - strike price))

Payoff from long put = ((strike price - spot price))

Payoff from short put = (- (strike price - market price))

Then, the profit from the position taken in call option and put option is calculated as follow:

Profit from long call = ((spot price - strike price) - premium)*Quantity

Profit from short call = (- (spot price - strike price) + premium)*Quantity

Profit from long put = ((strike price - spot price) - premium)*Quantity

Profit from short put = (- (strike price - market price) + premium)*Quantity

Third- call option Example: Assume an investor buy a call option (long call option) on two crude oil futures (equivalent to 2000 barrel) at strike price 87\$/barrel, and that the option costs 3\$/barrel (premium); and the delivery date or the expiration of the option is June 2023.

Thus, On June 2023, the call option holder has the right to buy crude oil futures for a strike price of \$87. If in June 2023, the market price (spot price) of crude oil futures is 100\$, 87\$ or 75\$,

Indicate the position the trader will take in each case? calculate the payoff and the profit in each case? draw the graph showing the profit of call options?

If on June 2023, the market price of crude oil futures is \$100, in this case, the trader long call option with a strike price of 87\$ becomes an **In-The-Money option**. with this, the trader position will **devolve into a long position in the futures contract** of crude oil; the option holder could exercise the option and buy crude oil futures for \$87 instead of the true market value of \$100; then, close the futures position immediately (offsetting the futures position by selling futures) will receive the difference between the futures price and the strike price. This comes up to \$13 (\$100 - \$87) per barrel. Multiplying this with the lot size will give you the true figure that the trader likely to receive.

Profit = ((spot price - strike price) - premium)* 2,000 bbls

Profit = ((100-87)-3)*2000= 20000\$

Or profit from the long call is (100-87)*2000=26000\$

The premium= 3*2000=6000\$

Then the net profit is 26000-6000=20000\$

If on June 2023, the market price of crude oil futures is \$87, in this case, the trader long call option with a strike price of 87\$ becomes an **At-The-Money option**. With this, the trader position

can also devolve into a **long position** in the futures contract of crude oil; or the contract would **expire worthless; in each case the call option holder would have lost the premium of \$6,000;** Because the spot price is equal to the strike price, so there is no difference between exercising the call option or letting it expire.

If on June 2023, the market price of crude oil futures is \$75, in this case, the trader long call option with a strike price of 87\$ becomes an Out-The-Money option. So, the crude oil call options will expire worthless. **The trader loss would amount to the entire premium of 6000\$ that he paid to acquire the said options.**

Now let's look at the option (same example) from the point of view of the seller. The seller is said to be the option writer, or to have a short position in a call option. The option writer is the counterparty to the option buyer. The writer receives the premium for the option and then has an obligation to sell the underlying security in exchange for the strike price if the option buyer exercises the option.

If on June 2023, the market price of crude oil futures is \$100, in this case, the trader short call option with a strike price of 87\$ becomes an Out-The-Money option. with this, the trader position will devolve into a short position in the futures contract of crude oil; the option writer have to exercise the option and sell the crude oil futures for \$87 instead of the true market value of \$100; then, close the futures position immediately (offsetting the futures position by buying futures) will incur a loss which is the difference between the futures price and the strike price.

Profit = $(-(\text{spot price} - \text{strike price}) + \text{premium}) * 2,000 \text{ bbls}$

Payoff = $(-(100-87)+3)*2000 = -20000\$$

Then the seller of call option incurs a loss of $-20000\$$

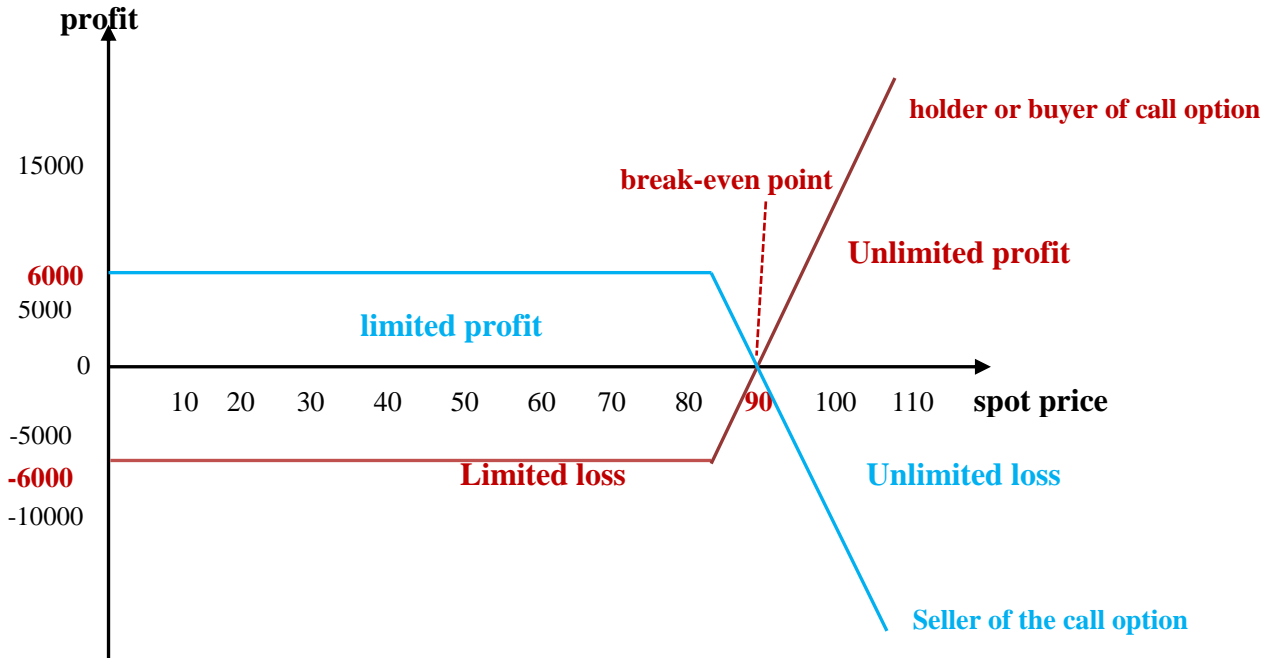
If on June 2023, the market price of crude oil futures is \$87, in this case, the trader short call option with a strike price of 87\$ becomes an In-The-Money option. With this, the trader position can devolve into a short position in the futures contract of crude oil; or the contract would expire worthless; this depends on buyer decision, **in both cases the option' seller makes a profit of 6000\$.**

If on June 2023, the market price of crude oil futures is \$75, in this case, the buyer of call option decides not to exercise the option so the crude oil call options will expire worthless. **Thus, the call option seller profit would amount to the entire premium of 6000\$ that he received when selling the said options.**

We can draw a graph that summarize the call option profit for both holder and seller, to do so, you have to keep in your mind strike price, the total premium and have to calculate the break-even point means at which price the trader do not make neither profit nor loss

$$\text{Break-even point (call)} = \text{strike price} + \text{Premium} = 87 + 3 = 90$$

Figure 8: Profit at expiration for purchase a crude oil call with a strike price 87\$



Source: Researcher' elaboration based on the example

From the example and the graph, taking in account that the buyer of a call option pays the option premium at the time of entering the contract and it is not refundable ; we can conclude that: If the price of the underlying asset exceeds the strike price, then, the call option buyer makes a profit which is unlimited - the higher the market price the higher the profit he will make because the call option holder has the right to buy at strike price (buy low). However, If the spot price of the underlying asset does not rise above the option strike price or goes down prior to the option's expiration, in this case the holder of the option chooses not to exercise the option and loses the amount they paid for the option (premium), so the call holder incurs a limited loss which is equal to the premium. In the other hand, the call option seller loss is potentially unlimited. As the spot price of the underlying asset exceeds the strike price, the writer of the option incurs a loss accordingly unlimited loss which is equal to the option *buyer's* profit. However, if the market price of the underlying asset does not go higher or stay the same as or goes down from the option strike

price, then the option holder let the call option expires worthless; and the option seller profit in the amount of the premium he received for the option (limited profit).

Forth- Put oil option example: Assume on March 2023, an investor buy a put option (long put option) on two crude oil futures (equivalent to 2000 barrel) on July 2023 crude oil futures at strike price 92\$/barrel, and that the option costs 2\$/barrel (premium).

Thus, On July 2023, the put option holder has the right to sell crude oil futures for a strike price of \$ 92. If in July 2023, the market price (spot price) of crude oil futures is 85\$, 92\$ or 98\$,

Indicate the position the trader will take in each case? calculate the payoff and the profit in each case? draw the graph showing the profit of put options?

If on July 2023, the market price of crude oil futures is \$ 85, in this case, the trader long put option with a strike price of 92\$ becomes an ITM option. with this, the trader position will devolve into a short position in the futures contract of crude oil; the option holder could exercise the option and sell crude oil futures for \$92 instead of the true market value of \$85; then, close the futures position immediately (offsetting the futures position by buying futures at 85\$) will receive the difference between the futures price and the strike price. This comes up to \$7 (\$92 – \$85) per barrel. Multiplying this with the lot size will give the true figure that the trader likely to receive.

Profit = ((strike price — spot price) - premium)* 2,000 bbls

Profit = ((92-85)-2)*2000= 10000\$

Or profit from the long put is (92-85)*2000=14000\$

The premium= 2*2000=4000\$

Then the net profit is 14000-4000=10000\$

If on June 2023, the market price of crude oil futures is \$92, in this case, the trader long put option with a strike price of 92\$ becomes an ATM option. With this, the trader position can also devolve into a short position in the futures contract of crude oil; or the contract would expire worthless; **in each case the put option holder would have lost the premium of \$4,000;** Because the spot price is equal to the strike price, so there is no difference between exercising the put option or letting it expire.

If on June 2023, the market price of crude oil futures is \$98, in this case, the trader long put option with a strike price of 92\$ becomes an OTM option. So, the crude oil put options will expire

worthless. **The trader loss would amount to the entire premium of 4000\$ that he paid to acquire the said options.**

Now let's look at the option (same example) from the point of view of the seller. The seller is said to have a short position in a put option. The option seller is the counterparty to the option buyer. The writer receives the premium for the option and then has an obligation to buy the underlying security in exchange for the strike price if the option buyer exercises the option.

If on July 2023, the market price of crude oil futures is \$85, in this case, the trader short put option with a strike price of 92\$ becomes an OTM option. with this, the trader position will devolve into a long position in the futures contract of crude oil; the option writer have to exercise the option and buy the crude oil futures for \$92 instead of the true market value of \$85; then the seller will incur a loss which is the difference between the strike price and the futures price.

Profit = $(-(\text{strike price} - \text{spot price}) + \text{premium}) * 2,000 \text{ bbls}$

Payoff = $(- (92-85)+2)*2000 = -10000\$$

Then the seller of put option incurs a loss of $- 20000\$$

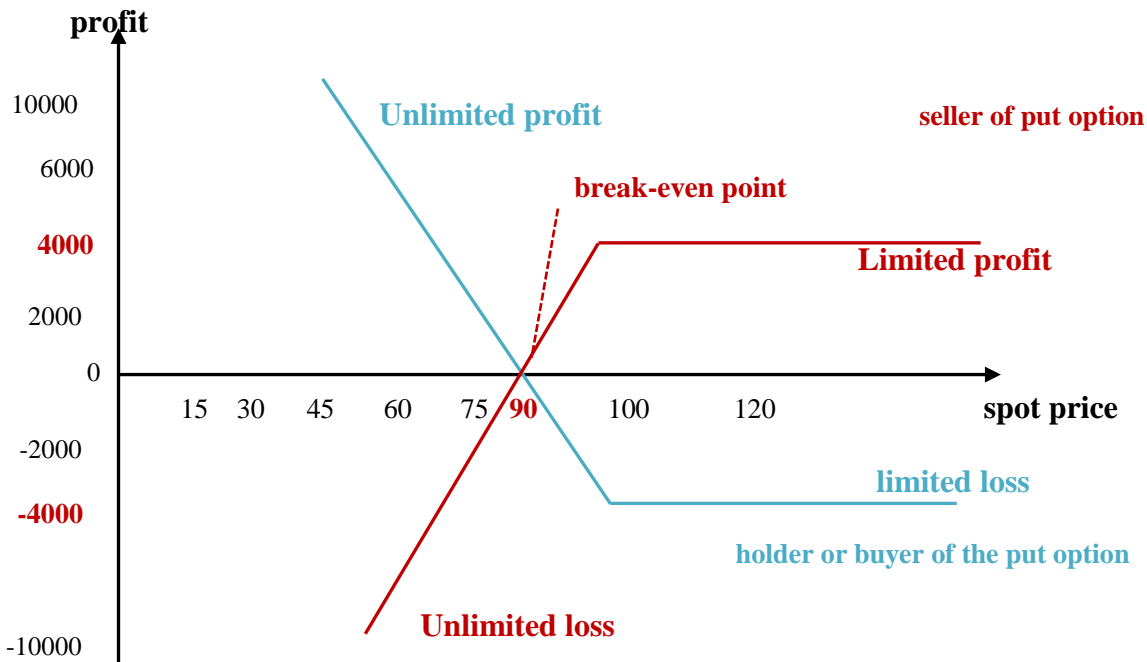
If on July 2023, the market price of crude oil futures is \$92, in this case, the trader short put option with a strike price of 92\$, with this, the trader position can devolve into a long position in the futures contract of crude oil; or the contract would expire worthless; this depends on buyer decision, **in both cases the option' seller makes a profit of 4000\$.**

If on June 2023, the market price of crude oil futures is \$98, in this case, the buyer of put option decides not to exercise the option so the crude oil put options will expire worthless. **Thus, the put option seller profit would amount to the entire premium of 4000\$ that he received when selling the said options.**

We can draw a graph that summarize the put option profit for both holder and seller, to do so, you have to keep in your mind strike price, the total premium and have to calculate the break-even point means at which price the trader do not make neither profit nor loss

Break-even point (put) = strike price - Premium = $92 - 2 = 90$

Figure 9: Profit at expiration for purchase a crude oil put with a strike price 92\$



Source: Researcher' elaboration based on the example

From the example and the graph, taking in account that the buyer of a put option pays the option premium at the time of entering the contract and it is not refundable ; we can conclude that: If the price of the underlying asset is less than the strike price, then, the put option buyer makes a profit which is unlimited - the lower the market price the higher the profit he will make because the put option holder has the right to sell at strike price (sell at high price). However, If the spot price of the underlying asset does not fall under the option strike price or goes up prior to the option's expiration, in this case the holder of the option chooses do not exercise the option and loses the amount they paid for the option (premium), so the put holder incurs a limited loss which is equal to the premium. In the other hand, the put option seller loss is potentially unlimited. As the spot price of the underlying asset be less than the strike price, the writer of the option incurs a loss accordingly unlimited loss which is equal to the option *buyer's* profit. However, if the market price of the underlying asset does not go lower or stay the same or goes up from the option strike price, then the option holder let the put option expires worthless; and the option seller profit in the amount of the premium he received for the option (limited profit).

2.5. Characteristics of option contracts

From the previous example we can conclude the characteristics of the call and put option.

Table 4: Summary of four basic characteristics of put and call options position

	Call Option	Put Option
Option Buyer (Holder)	<ul style="list-style-type: none"> - Has the right to buy commodity futures at strike price on the expiration date. - Pay the option premium. - Makes profit when the price of the commodity futures rises. - Makes unlimited profit. - Incurs a limited loss which is equal to premium. 	<ul style="list-style-type: none"> - Has the right to sell commodity futures at strike price on the expiration date. - Pay the option premium. - Makes profit when the price of the commodity futures falls. - Makes unlimited profit. - Incurs a limited loss which is equal to premium.
Option Seller (Writer)	<ul style="list-style-type: none"> - Obligated to sell the commodity futures at strike price on the expiration date. - Has the right to receive premium. - Makes profit from the price stability or price fall. - Makes a limited profit (equal or less than premium) - Incurs unlimited loss. 	<ul style="list-style-type: none"> - Obligated to buy the commodity futures at strike price on the expiration date. - Has the right to receive premium. - Makes profit from the price stability or price rise. - Makes a limited profit (equal or less than premium) - Incurs unlimited loss.

Source: researcher' elaboration

Practice Questions

Exercise 1: *choose the right answer*

1. The option contract is?

- a. The right to own the stock of business company.
- b. The right to buy a future contract.
- c. The right to buy or sell an underlying asset at spot price on the expiration date.
- d. The right to buy or sell an underlying asset at a strike price before the expiration date.

2. The Put option is?

- a. The right to buy the underlying asset on or before the maturity.
- b. The right to sell the underlying asset on or before the maturity.
- c. The right to buy the underlying asset at a strike price on the expiration date.
- d. None of the above.

3. The Call option give the holder the right to?

- a. Sell an underlying asset at strike price.
- b. Buy a futures contract at strike price on or before the expiration date.
- c. Buy a futures contract at spot price on the expiration date.

4. The European style Put option give the right to?

- a. Buy underlying asset at strike price on or before the expiration date.
- b. Sell the underlying asset at strike price on or before the expiration date.
- c. Buy the underlying asset at strike price on the expiration date.
- d. None of the above

5. The other name for Put option buyer is ?

- a. Someone who is short.
- b. Someone who is bullish in the market.
- c. Option holder.

6. When someone "writes" a call option, he/she has?

- a. Taken a "long" position in a futures contract.
- b. "marked to market" a futures contract.
- c. Sold a call option.
- d. Bought a call option.
- e. exercised a call option.

7. If the June crude oil futures contract were currently trading at \$95/BBL, a June crude oil call option with a strike price of \$90/BBL would be considered?

- a. In-the-money.
- b. Out-the- money
- c. At-the-money

8. If the June crude oil futures contract were currently trading at \$95/BBL, June crude oil put option with a strike price of \$90/BBL would be considered?

- a. At-of-the-money.
- b. In-the-money
- c. Out-the-money
- d. None of the above

9. A Call option of strike price 150\$ was bought by paying a premium of 4\$ and the underlying asset price upon expiry is 162. The total profit made is ?

- a. 12
- b. 4
- c. 8

10. An Out of Money Put option contract is ?

- a. One where the strike price is under the spot price.
- b. One where the strike price is above the spot price.
- c. One where the strike price equal spot price.

11. If the strike price of call option is 20\$, the call option said to be Out-the-money if the spot price at expiration date is equal to?

- a. 20\$
- b. 32\$
- c. 15\$

12. The break-even point is?

- a. The price at which the profit is high.
- b. The price at which the loss is limited
- c. The price at which the holder doesn't makes neither profit nor loss.

Exercise 2:

I. Assume on July 2022, A trader buys a European-style call options on October 2022 soybean futures at strike price of \$12, and that the call option cost (premium) of 0.5\$/bushel; the Soybean futures contract units are 5000bushels; If on October 2022, the Soybean futures price is \$13/bushel, 10.8\$/bushel or 12\$/bushel. **Indicate the position the trader will take in each case? calculate the payoff and the profit in each case? draw the graph showing the profit of call options?**

II. Assume that on Sept. 2022, Atrader buys European-style put options on April 2023 crude oil futures at a strike price of \$70 per barrel (BBL), and that the option costs \$1.5 per barrel. Crude oil futures contract units are 1,000 barrels. If on April 2023 crude oil futures price is \$62/BBL, 70\$/BBL or 80\$/BBL. **Indicate the position the trader will take in each case? calculate the payoff and the profit in each case? draw the graph showing the profit of put options?**

Answers

Answer of the Exercise 1

<i>Question n°</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
<i>Answer</i>	<i>d</i>	<i>b</i>	<i>b</i>	<i>d</i>	<i>c</i>	<i>c</i>	<i>a</i>	<i>c</i>	<i>c</i>	<i>a</i>	<i>c</i>	<i>c</i>

Answer of the exercises

II. - If on October 2022, the market price of Soybean futures is \$13

The trader long call option with a strike price of 12\$ becomes an **In-The-Money option**.

The trader position will **devolve into a long position in the futures contract** of Soybean; the option holder could exercise the option and buy soybean futures for \$12 instead of the true market value of \$13; then, close the futures position immediately will receive the difference between the futures price and the strike price, this comes up to \$1 ($13 - 12$) per bushel.

Payoff = (spot price – strike price) = $13 - 12 = 1$ \$/bushel

Profit = ((spot price - strike price) - premium)* 5,000 bushel

Profit = $((13-12)-0.5)*5000= 2500$ \$

-If on October 2022, the market price of Soybean futures is \$12,

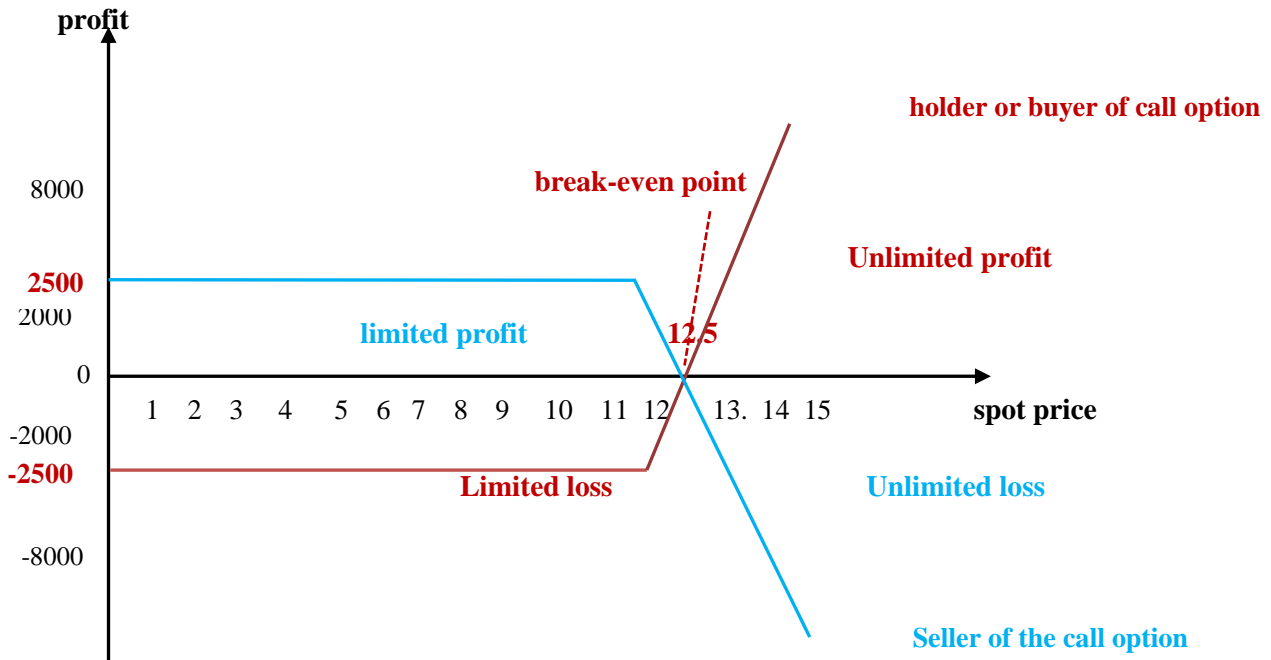
The trader long call option with a strike price of 12\$ becomes an **At-The-Money option**.

The trader position can also devolve into a **long position** in the futures contract of Soybean; or the contract would **expire worthless; in each case the call option holder would have lost the premium of $0.5*5000 = 2500$ \$**.

-If on October 2022, the market price of Soybean futures is \$10.8.

The trader long call option with a strike price of 12\$ becomes an Out-The-Money option. So, the Soybean call options will expire worthless. **The trader loss would amount to the entire premium of 2500\$ that he paid to acquire the said options.**

We can draw a graph that summarize the call option profit for both holder and seller, to do so, we have to calculate the break-even point $\text{Break-even point (call)} = \text{strike price} + \text{Premium} = 12 + 0.5 = 12.5$



III. If on April 2023, the market price of crude oil futures is \$ 62,

The trader long put option with a strike price of 70\$ becomes an In-The-Money option.

The trader position will devolve into a short position in the futures contract of crude oil; the option holder could exercise the option and sell crude oil futures for \$70 instead of the true market value of \$62; then, close the futures position immediately will receive the difference between the futures price and the strike price. This comes up to $\text{Payoff} = \$8 (\$70 - \$62)$ per barrel.

Profit = ((strike price — spot price) - premium)* 1,000 bbls

$\text{Profit} = ((70-62)-1.5)*1000= 6500\$$

If on April 2023, the market price of crude oil futures is \$70,

The trader long put option with a strike price of 70 \$ becomes an At-The-Money option.

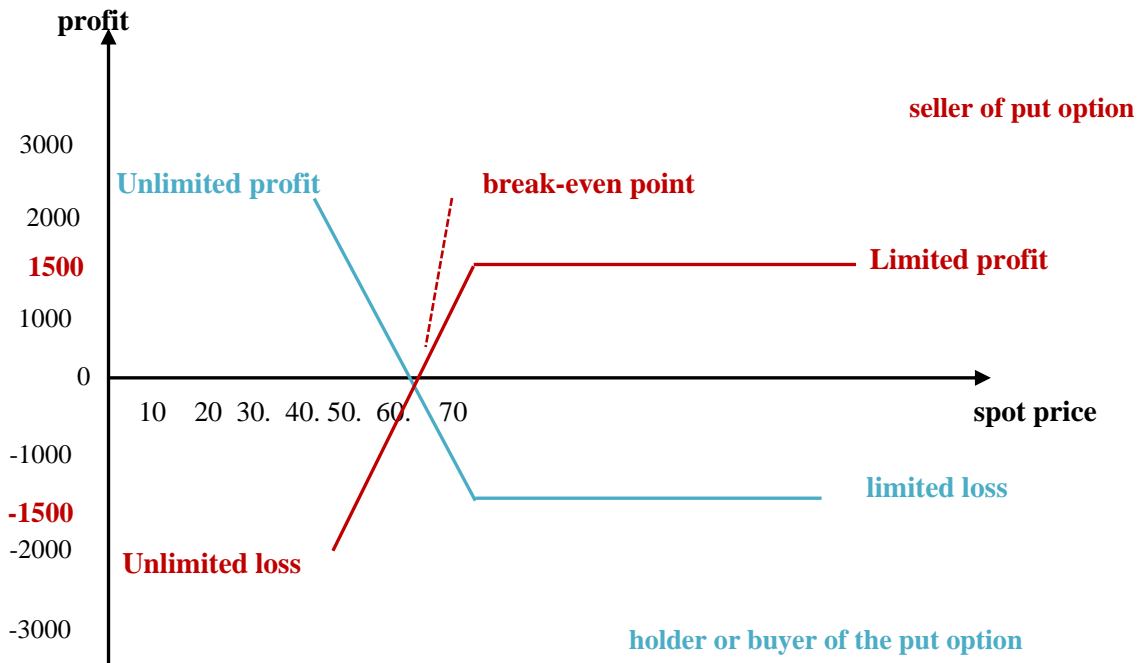
The trader position can also devolve into a short position in the futures contract of crude oil; or the contract would expire worthless; **in each case the put option holder would have lost the premium of (1.5*1000) 1500 \$.**

If on April 2023, the market price of crude oil futures is \$80.

The trader long put option with a strike price of 70\$ becomes an Out-The-Money option.

So, the crude oil put options will expire worthless. **The trader loss would amount to the entire premium of 1500\$ that he paid to acquire the said options.**

We can draw a graph that summarize the put option profit for both holder and seller, to do so, we have to calculate the break-even point $\text{Break-even point (put)} = \text{strike price} - \text{Premium} = 70 - 1.5 = 68.5\$$



**Chapter five:
commodity forwards
pricing**

Forward contract refers to an agreement between two parties to buy or sell an underlying asset at certain date in the future and at a specified price. This derivative contract is used to hedge against price risk by locking the future price; this guaranteed price can be very important, especially in industries that commonly experience significant volatility in prices. Forward price is the predetermined and agreed upon price of an underlying asset in a forward contract, this price accounts for various factors such as opportunity costs, foregone interest, and storage cost, insurance cost, spoilage cost, as well as the current spot price. One of the parties of the contract agreeing to buy (long position) the other is agreeing to sell (short position). If the price of the underlying asset goes up, the long position benefits, if the underlying asset price goes down, the short position benefits. Forward contracts can also be used for Arbitrage purposes. If the arbitrageur believes that the future spot price of an underlying asset will be higher than the forward price today, they may enter into a long forward position.

1. Forward contract

1.1. Definition of forward contract

A forward contract is a contract between two parties. It states that one of the two parties is to buy something from the other at a later date at a price agreed upon today (Sacks, 2016).

Forward contract is an agreement to buy or sell an asset at a certain future time for a certain price it can be contrasted with a spot contract which is an agreement to buy or sell an asset today. A forward contract is traded in the over-the-counter (OTC) market usually between two financial institutions or between a financial institution and one of its clients. One of the parties to forward contract assume a long position and agree to buy the underlying asset on a certain specified future date for a certain specified price the other party assume a short position and agree to sell the asset on the same date for the same price (Hull, Option, Future and other Derivatives, 2008).

1.2. Forward contract components

From the definition of a **forward contract**: we can conclude that this contract has four main components (McDonald, 2012):

- **Underlying asset:** The asset or commodity on which the forward contract is based

- **Expiration Date:** The contract specifies delivery date, i.e. the time at which the contract is settled and the asset is delivered and the deliverer is paid.
- **Price:** The price that will be paid by the buyer at time of delivery must also be specified. This will also include the currency that payment will be rendered in.
- **Quantity:** Specifies the quantity (give the specific amount in units of the asset being bought and sold) and exact type of the asset or commodity the seller must deliver.
- **Obligation:** obligates the seller to sell and the buyer to buy, subject to the above specifications. On the expiration date, the contract must be settled ; the seller will deliver the underlying asset, while the buyer will pay the agreed-upon price and take possession of the asset. Forwards can also be cash-settled at the date of expiration rather than delivering the physical underlying asset.

1.3. Settlement of Forward contracts

A forward contract is a customized contract between two parties to purchase or sell an underlying asset in time and at a price agreed upon today (known as the forward price). One party is the buyer of the contract called the long, he is betting that the price will go up; and the other party is the seller of the contract called the short, he is betting that the price will go down. At expiration date (maturity), the forward contract can be settled in cash or by the actual delivery of the underlying asset.

- **Physical Delivery:** In a physical delivery settlement, the long receive the underlying asset and pay the agreed-upon price to the short.
- **Cash settlement:** in the cash settlement, one of the contract parties (seller or buyer) receives the difference between the market price and the forward price.

In the forward contract the parties are agreed to buy or sell the underlying asset at forward price F_0 (delivery price), and S_T is the market price (Spot price) Then at the expiration date, the value of the contract is:

$$S_T - F_0 \dots\dots\dots \textit{For Buyer (long)}$$

$$F_0 - S_T \dots\dots\dots \textit{For Seller (Short)}$$

The forward contract's value may be negative or positive, depending on price fluctuations of the underlying asset (S_T).

2. Forward Price and value

2.1. Forward price concept

Forward price (known also as the forward rate) is the predetermined and agreed delivery price for an underlying commodity, currency, or financial asset as decided by the buyer and the seller of the forward contract to be paid at a predetermined date in the future. Forward price is based on the current market price of the underlying asset, plus any carrying costs such as interest, storage costs, foregone interest or other costs.

2.2. Forward price calculation

Forward price is the price at which the long forward is obligated to purchase the underlying asset from the short forward at the expiration of the forward. The forward price is set at initiation and does not change over the life of the forward. Let's explore the equation through which one can calculate the forward price. In the next chapter we will learn *why* this equation represents forward price (Gottesman, 2016).

The pricing model used to calculate forward prices makes the following assumptions (Gottesman, 2016):

- No transaction costs or short-sale restrictions.
- Same tax rates on all net profits.
- Borrowing and lending at the risk-free-interest
- Arbitrage opportunities are exploited as they arise.

For the development of a forward pricing model, we will use the following notation:

- T : time to maturity or the expiration date (in years) of the forward contract.
- S_0 : underlying asset price on the initiate date ($t_0 = 0$).
- F_0 : forward price today.
- r : continuously compounded risk-free annual rate.
- e : Euler's number which is equal to 2.71828182

- *q*: Storage Cost

A commodity's forward price is based on its current spot price, and the cost of carry during the interim before delivery. Cost of carry refers to the price of storage of the commodity. Commodity forward price can be calculated as follows:

First- When there is no storage costs: the forward price is the spot price of the commodity Multiply by Euler's number (2.718281828...) raised to the risk-free interest rate multiplied by the time to maturity. The forward price formula is seen below (Gottesman, 2016):

$$F_0 = S_0 e^{rt} \dots\dots\dots(1)$$

Example:

- Assume the spot price of Gold is \$1,200 per ounceThe six-month forward contract on gold, given a risk-free interest rate of 2.5% is $F_0 = 1200 e^{0.025 \times 6/12} = 1215.094\$$
- Josh is looking to enter into a forward contract for an investment asset currently trading at \$1,000. The risk-free rate in Josh's country is 4%. The one year forward price for this asset can be calculated as: $F_0 = 1000 e^{0.04 \times 1} = 1040.81\$$

Second- When there is a storage costs expressed as proportion: the forward price is the spot price of the commodity Multiply by Euler's number (2.718281828...) raised to the risk-free interest rate plus the storage costs multiplied by the time to maturity. The storage costs (net of income) incurred at any time are proportional to the price of the commodity, they can be treated as negative yield (Hull, 2012, p. 118). The forward price formula is seen below (Hull, 2012, p. 118):

$$F_0 = S_0 e^{(r+u)t} \dots\dots\dots(2)$$

where u denotes the storage costs per annum as a proportion of the spot price net of any yield earned on the asset.

Example:

- The spot price of wheat is 514\$ / bushels, if you know that the cost of storage is 12% per unit and the risk-free rate of return is 7%, what is the price of a 4-month forward contract? The price of the 4-month forward is $F_0 = 514 e^{(0.07+0.12) \times \frac{4}{12}} = 547.61\$$.

Third-When there is a storage costs expressed as amount: the forward price is the spot price plus the storage price of the commodity Multiply by Euler's number (2.718281828...) raised to the risk-free interest rate multiplied by the time to maturity. The forward price formula is seen below (Hull, 2012, p. 118):

$$F_0 = (S_0 + U) e^{rt} \dots\dots\dots(3)$$

Example

- Assume the spot price of gold is \$1200 per ounce and it costs \$5 per ounce to store the gold for six months, given a risk-free interest rate of 2.5%, the cost of storage is $U = 5e^{0.025 \times 6/12} = 5.063\$$;

The six-month forward contract on gold $F_0 = (1200 + 5.063) e^{0.025 \times \frac{6}{12}} = 1220.22\$$

- Assume the spot price of steel is \$420/ton, if you know that the cost of storage is \$2 per unit and the risk-free rate of return is 10%, what is the price of a 3-month forward contract? $U = 2e^{0.1 \times 3/12} = 2.051\$$

The 3-month forward price is $F_0 = (420 + 2.051) e^{0.1 \times \frac{3}{12}} = 432.735\$$

2.3. Forward value

Forward value is the value of holding a position in a forward at a given point in time during the life of the forward. While forward value will be zero at initiation, after initiation forward value will either be positive (an asset) or negative (a liability). Let's explore an equation through which one can calculate forward value ; the value of a forward is, by design, zero at initiation. Following initiation, the value of the forward from the long forward's perspective is (Gottesman, 2016):

$$f_t = S_t - Fe^{-r(T-t)}$$

where :

f_t = Long forward value, F = Forward price

t = Valuation date T = Expiration date

$T - t$ = Years between the valuation date and the expiration date S_t = Underlying asset price on the valuation date

r = Continuously compounded risk-free interest rate on the valuation date

This equation is from the long forward's perspective. Forwards are zero-sum games. Hence, the short forward's value is $-f_t$, the negative of the long forward's value.

We see that the determinants of forward value are (Gottesman, 2016):

- The underlying asset price on the valuation date
- The forward price
- The risk-free interest rate on the valuation date
- The time to expiration

Examples:

- An investor has entered into a long forward. The forward has 0.5 years remaining until expiration. The continuously compounded risk-free interest rate is 6%. The forward price is \$900. The underlying asset price is \$850. What is the forward value? Is the forward an asset or a liability? The answer is:

$$f_t = S_t - F e^{-r(T-t)} = \$850 - \$900 e^{-0.06 \cdot 0.5} = -23.4$$

Hence, the long forward's value is -23.4 and the short forward's value is 23.4 . Since the long forward value is negative and the short forward value is positive the long forward has a liability and the short forward has an asset.

- An investor has entered into a long forward. The forward has 1 years remaining until expiration. The continuously compounded risk-free interest rate is 4%. The forward price associated is \$70. The underlying asset price is \$75. What is the forward value? Is the forward an asset or a liability? The answer is:

$$f_t = S_t - F \cdot e^{-r \cdot (T-t)} = \$75 - \$70 e^{-0.04 \cdot 1} = 7.745\$$$

Hence, the long forward's value is 7.745 \$ and the short forward's value is 7.745 \$ Since the long forward value is positive and the short forward value is negative, the long forward has an asset and the short forward has a liability.

2.4. Arbitrage opportunities using forward contract

Arbitrage: involves the simultaneous buying and selling of a security (like equity, forward or futures) to benefit from the price differential between the buy and sell price (i.e. the bid and ask spread) (Baldrige, 2021). Arbitrage: consists in taking advantage of the difference in prices from one market to another (i.e. buying in the market where the price is low and resale in the market where the price is high).

Example: if the price of gold at Comex is \$1,825/Ounce, and at the same time on a local exchange bullion is sold at \$1,827/Ounce. One can simultaneously buy at the lower price and sell it at the higher There are many ways to arbitrage if the opportunity arises.

In commodity market the arbitrage meant also to take advantage of the difference between the spot and forward prices.

Assume the current Asset price is \$70 and the 6-month risk-free interest rate is 4% per annum. Suppose first that the forward price is relatively high at \$73. An arbitrageur can borrow \$70 at the risk-free interest rate of 4% per annum, buy one unit of the commodity "X", and short a forward contract to sell one unit of the commodity "X" in 6-months. At the end of the 6-months, the arbitrageur delivers the one unit of the commodity "X", and receives \$73. The sum of money required to payoff the loan is : $70 e^{0.04 \times 6/12} = 71.41\$$.

By following this strategy, the arbitrageur locks in a profit of $\$73 - \$71.41 = \$1.59$ at the end of the 6-month period.

Suppose next that the forward price is relatively low at \$69. An arbitrageur can short one share, invest the proceeds of the short sale at 5% per annum for 3 months, and take a long position in a 3-month forward contract. The proceeds of the short sale grow to $70 e^{0.04 \times 6/12} = 71.41\$$, in 6 months. At the end of the 6 months, the arbitrageur pays \$68, takes delivery of the the commodity

“X” under the terms of the forward contract, and uses it to close out the short position. A net gain of $\$71.41 - \$69 = \$2.41$

is therefore made at the end of the 6 months. The two trading strategies we have considered are summarized in the following table.

Table 05: Arbitrage opportunities

Forward price = 73	Forward price = 69
Action now:	Action now :
Borrow \$70 at 4% for 6 months	Short 1 unit of asset to realize \$70 Invest \$70 at 4% for 6 months
Buy one unit of asset	
Enter into forward contract to sell asset in 6 months for \$73	Enter into a forward contract to buy asset in 6 months for \$69
Action in 6 months:	Action in 6 months :
Sell asset for \$73	Buy asset for \$69
Use \$71.41 to repay loan with interest	Close short position
	Receive \$71.41 from investment
Profit realized = \$1.59	Profit realized = \$2.41

Source: Author elaboration based on the example above

Under what circumstances do arbitrage opportunities such as those in Table above not exist? The first arbitrage works when the forward price is greater than \$71.41. The second arbitrage works when the forward price is less than \$71.41. We deduce that for there to be no arbitrage the forward price must be exactly \$71.41.

To generalize this example, we consider a forward contract on an investment asset with price S_0 that provides no income. Using our notation, t is the time to maturity, r is the risk-free rate, and F_0 is the forward price. The relationship between F_0 and S_0 is : $F = S_0 e^{rt}$ (4) (Hull, 2012)

If $F_0 > S_0 e^{rt}$, arbitrageurs can buy the asset and short forward contracts on the asset.

If $F_0 < S_0 e^{rt}$, they can short the asset and enter into long forward contracts on it⁵. (Hull, 2012) In our example, $S_0 = 70$, $r = 0.04$, and $t = 0.5$, so that equation (4) gives $F_0 = 70e^{0.04 \times 0.5} = \71.41

Example:

If the spot price of gold is \$41.47/g and the forward price for three months is \$43/g, then the investor can profit from the price difference as follows:

The investor borrows \$41.47 for 3 months at a risk-free rate to buy gold, the interest rate is 5% per annum. And he used the money to buy gold. At the same time, he enters into a 3-month forward contract, he must take delivery of gold and receive \$43.

The sum of money required to payoff the loan is : $41.47 e^{0.05 \times 3/12} = 41.99\$$; at the end of the 3-months, the arbitrageur delivers the Gold, and receives \$43. By following this strategy, the arbitrageur locks in a profit of $\$43 - \$41.99 = \$1.01$ at the end of the 3-month period.

If the spot price of gold is \$40/g, the price of the 3-month futures contract is \$38/g, and the interest rate is 5% per annum. Is there arbitrage opportunity?

Suppose investor sell gold and receive \$40, and invest \$40 for a period of 3 months at a risk-free rate. At the same time, he enters into a 3-month forward contract, buy back the gold and pay \$38 (forward price).

Investor receive from the investment $\$40e^{0.05 \times 3/12} = 40.5\$$

And so, investor have obtained: $40.5 - 38 = 2.5 \$$. So, we say that there is an arbitrage opportunity.

Generalized (Hull, 2012): Assume that the underlying asset has no storage costs or income.

- If $F_0 > S_0 e^{rt}$, an investor can adopt the following strategy:

1. Borrow S_0 dollars at an interest rate r for T years.
2. Buy 1 unit of the asset.
3. Short a forward contract on 1 unit of the asset.

⁵ For another way of seeing that equation (4) is correct, consider the following strategy: buy one unit of the asset and enter into a short forward contract to sell it for F_0 at time t . This costs S_0 and is certain to lead to a cash inflow of F_0 at time t . Therefore S_0 must equal the present value of F_0 ; that is, $S_0 = F_0 e^{-rt}$, or equivalently $F_0 = S_0 e^{rt}$ (Hull, Option, Futures, and other Derivatives, 2012).

At time t , the asset is sold for F_0 . An amount $S_0 e^{rt}$ is required to repay the loan at this time and the investor makes a profit of $F_0 - S_0 e^{rt}$.

- If $F_0 < S_0 e^{rt}$, in this case, an investor who owns the asset can:

1. Sell the asset for S_0 .
2. Invest the proceeds at interest rate r for time t .
3. Take a long position in a forward contract on 1 unit of the asset.
4. At time t , the cash invested has grown to $S_0 e^{rt}$. The asset is repurchased for F_0 and the investor makes a profit of $S_0 e^{rt} - F_0$ relative to the position the investor would have been in if the asset had been kept.

Practice Questions

1. If the spot price of gold is \$41/g and the risk-free rate of return is 10%, what is the price of a 3-month forward contract.
2. The spot price of steel is \$405/ton, given that the cost of storage is \$3 per unit and the risk-free rate of return is 8 %, what is the price of a 6-month forward contract.
3. The spot price of wheat is \$515/bushels, if you know that the cost of storage is 10% per unit and the risk-free rate of return is 5%, what is the price of a 6-month forward contract? (a bushel is a measure of grain, where 1 bushel = 26 kg)
4. If the spot price of cotton is \$56.5/Lbs, the 4-month forward price is \$60/Lbs, and the interest rate is 9% per annum. Is there an arbitrage opportunity? Explain how this is done? (Lbs is a unit used for some strategic commodities such as cotton, 0.45 kg = 1Lbs)
5. If the spot price of soybeans is \$840/bushels, the 6-month futures price is \$815/bushels, and the interest rate is 3% per annum. Is there an arbitrage opportunity? Explain how this is done?
6. Suppose that you enter into a 6-month forward contract on a non-dividend-paying stock when the stock price is \$30 and the risk-free interest rate (with continuous compounding) is 12% per annum. What is the forward price?
7. A 1-year long forward contract on a non-dividend-paying stock is entered into when the stock price is \$40 and the risk-free rate of interest is 10% per annum with continuous compounding.
 - (a) What are the forward price and the initial value of the forward contract?

- (b) Six months later, the price of the stock is \$45 and the risk-free interest rate is still 10%. What are the forward price and the value of the forward contract?
8. The spot price of silver is \$15 per ounce. The storage costs are \$0.24 per ounce per year payable quarterly in advance. Assuming that interest rates are 10% per annum for all maturities, calculate the forward price of silver for delivery in 9 months.
 9. The spot price of oil is \$80 per barrel and the cost of storing a barrel of oil for one year is \$3, payable at the end of the year. The risk-free interest rate is 5% per annum continuously compounded. What is an upper bound for the one-year futures price of oil?
 10. A trader owns gold as part of a long-term investment portfolio. The trader can buy gold for \$1,250 per ounce and sell it for \$1,249 per ounce. The trader can borrow funds at 6% per year and invest funds at 5.5% per year (both interest rates are expressed with annual compounding). For what range of 1-year forward prices of gold does the trader have no arbitrage opportunities? Assume there is no bid–offer spread for forward prices.

Answers

1. The three-month forward contract on gold, given a risk-free interest rate of 10% is $F_0 = 41 e^{0.1 \times 3/12} = 42.04\$$
2. the cost of storage is $U = 3e^{0.08 \times 6/12} = 3.122\$$;
The six-month forward contract on Steel $F_0 = (405 + 3.122) e^{0.08 \times \frac{6}{12}} = 424.778\$$
3. The price of the 4-month forward is $F_0 = 515 e^{(0.05+0.1) \times \frac{6}{12}} = 555.11\$$.
4. There is an arbitrage opportunity because the forward price is relatively high at \$60. The investor can borrow \$56.5 for 4-months at a risk-free rate to buy cotton, the interest rate is 9% per annum. And he used that money to buy cotton. At the same time, he enters into a 4-month forward contract, he must take delivery of cotton and receive \$60.

The sum of money required to payoff the loan is : $56.5 e^{0.09 \times 4/12} = 58.22\$$; at the end of the 4-months, the investors deliver the cotton, and receives \$60. By following this strategy, the investor locks in a profit of $\$60 - \$58.22 = \$1.78$ at the end of the 3-month period.

5. There is an arbitrage opportunity because the forward price is relatively low at 815. An arbitrageur can sell the soybean, invest the proceeds of the short sale at 3% per annum for 6 months, and take a long position in a 6-month forward contract. The proceeds of the short sale grow to $840 e^{0.03 \times 6/12} = 852.69$, in 6 months. At the end of the 6 months, the arbitrageur pays \$815, takes delivery of the commodity "X" under the terms of the forward contract, and uses it to close out the short position. A net gain of $\$852.69 - \$815 = \$37.69$
6. The six-month forward contract on stock, given a risk-free interest rate of 12% is $F_0 = 30 e^{0.12 \times 6/12} = 31.855$
7. (a)- The 1-year forward price is $F_0 = 40 e^{0.1 \times 1} = 44.21$ \$. the value of forward contract is
 $f_t = S_t - F_0 \cdot e^{-r(T-t)} = \$40 - \$44.21 e^{-0.1 \times 1} = 0$ \$
 (b)-The forward price is: $F_0 = 40 e^{0.1 \times 6/12} = 42.051$ \$. the value of forward contract is
 $f_t = S_t - F_0 \cdot e^{-r(T-t)} = \$45 - \$44.21 e^{-0.1 \times (1-6)/12} = 2.946$ \$
8. The storage cost $U = 0.24 e^{(0.1) \times \frac{9}{12}} = 0.259$ \$. The 9-month the forward price of silver is $F_0 = (15 + 0.259) e^{0.1 \times \frac{9}{12}} = 16.447$ \$.
 9. The storage cost $U = 3 e^{(0.05)} = 3.15$ \$. The 1-year forward price of silver is $F_0 = (80 + 3.15) e^{0.05} = 87.41$ \$.
 10. The 1-year forward price is $F_0 = 1.250 e^{0.06 \times 1} = 1.327$ \$, so, when the trader short a forward contract, he will not have arbitrage opportunity if the price of forward is less than 1.327\$
 The 1-year forward price is $F_0 = 1.249 e^{0.055 \times 1} = 1.320$ \$, when the trader long a forward contract, he will not have arbitrage opportunity if the price of forward is more than 1.320\$

**Chapter six:
Speculation in commodity
markets**

Speculation in commodity market remains a primary force and has dramatically increased far exceeds amounts necessary to facilitate legitimate commercial hedging; as long as there is trading in assets and financial instruments, with the potential for profit, there will be investors aiming to make money through taking position in futures contract, with the hope that the price of financial instrument (futures) will move in their favor. Speculative investors tend to make decisions more often based on technical analysis of market price action, they are betting that the price of the asset will go up or they are betting that it will go down.

1. Concept of Speculation

In commodity market the investors can use the commodities futures to avoid exposure to adverse movement in the price of an asset, this what we called hedging; or to make profit from the price movement, the speculators take a position in the market either they are betting that the price of the asset will go up or they are betting that it will go down.

1.1. Definition of speculation

Speculation is the buying (selling) of an asset or financial instrument with the hope that the price of the asset or financial instrument will increase (decrease) in the future (CFI Team, 2023).

1.2. Speculators

Speculators are those who buy and sell futures contracts to profit from changes in commodity prices, interest rates, etc. They are prepared to accept risks that hedgers do not wish to assume, and they provide liquidity to the market – that is, they help to ensure that there is an active market in futures contracts with up-to-date prices, and that at any given time buyers and sellers are both in operation (Chisholm, 2010).

A classic case is the trader who believes that increasing demand or reduced supply is likely to boost the market price of oil. Since it would be too expensive to buy and store the physical commodity, the trader buys exchange-traded futures contracts agreeing to take delivery of oil on a future delivery date at a fixed price. If the oil price rises in the spot market, the value of the futures

contracts will also rise and they can be sold back into the market at a profit. In fact if the trader buys and then sells the futures contracts before they reach the delivery point the trader never has to take delivery of any actual oil. The profit from the trades is realized in cash (Chisholm, 2010).

1.3. Types of Speculators

There are two type of the speculator, bullish and bearish speculators.

i. Bullish speculator

A bullish investor is one who believes that the price of one or more securities will rise. **bullish speculator** expects the prices of securities to rise ; so, he buys – long securities with the hope of selling them at a higher price in the future and make a profit.

2. Bearish speculator

A bearish investor is one who believes prices of securities will fall. **A bearish speculator** is one who expects the prices of securities to fall in the future ; so, he sells – short securities, with the hope to profit from being able to repurchase them at a lower price at some point in the future.

1.4. Advantage and disadvantage of speculation

One of the notable characteristics of speculators is that they are ready to trade in both bear and bull markets, because they take the appropriate position in futures contract according to their expectation about the market trend – they are equally comfortable with both buying long and selling short. The market profit and take advantage from these characteristics.

First-Advantages of Speculation

i. Welfare of the economy

Speculators are typically willing to take on greater investment risk than the average investor, they are more willing to invest in a company, asset, or security that is unproven or whose stock is trading at a very low price, during times or in situations where the average investors become more conservative. The speculators represent the hedger counterparty, for example when the company

wants to hedge against the risk of falling price it could short futures contracts, in other side there are a speculator who are betting that the price of the same asset will go up and long futures contracts, so without the speculators the hedging become impossible, the company will face the risk and get no the hedging opportunity which push it away from the investment (Speculators acts as an insurer by providing price insurance or hedging services). In addition, speculators often provide the capital that enables young companies to grow and expand, or that provides price support for assets or industries that have temporarily fallen on financially hard times or out of favor. Speculation enables diversion of savings and flow of funds into productive channels. Thus, help to support and drive forward the overall economy.

ii. Market liquidity

Speculators add liquidity to the markets by risking their own capital in the hope of profit. A market without speculators would be an illiquid market, characterized by large spreads between bid and ask prices, and where it might be very difficult for investors to buy or sell investments at a fair market price. The participation of speculators keeps markets fluid and make it easier or even possible for hedgers to offset risk, and arbitrageurs to make a profit from the price difference between to market in the same point of time.

iii. Risk bearing

The higher risk tolerance of speculators translates to financing for companies being more widely and readily available. Speculators are willing to risk lending money to companies, governments, or business ventures that either lack established credit or that are currently with poor credit rating. Without speculators, the only businesses able to obtain loans would be those large, already established firms with a stellar credit rating. (CFI Team, 2023)

Second- Disadvantages of Speculation

i. Unreasonable prices

Speculation can sometimes push prices beyond reasonable levels, to excessively high or low valuations that do not accurately reflect an asset or security's true intrinsic value. It means that

speculation may lead to price fluctuations that, even though they are merely temporary, can have a long-term impact on the stability of a company, an industry, or even a whole economy. **For example**, some economists and market analysts have argued that extremely high oil price early in the 21st century – around \$100 a barrel – were due more to widespread speculation than to actual supply and demand conditions in the marketplace (CFI Team, 2023).

ii. Economic bubbles

Speculation is often associated with economic bubbles. A bubble occurs when the price of an asset become unreasonable or exceeds its intrinsic value by a significant margin. Speculative bubbles are characterized by rapid market expansion driven by word-of-mouth as initial rises in commodity price attract new buyers, the cycle is repeated – rising prices as a result of increased demand from speculators, followed by new buyers attracted by the rapidly rising prices increasing demand further, driving the market to even higher prices – until the bubble bursts and prices dramatically decline.

iii. Volatility

For a speculator, a good performance would occur when there is a very high level of volatility. It is a controversial point whether the presence of speculators increases or decreases the short-term volatility in a market. Their provision of capital and information may help stabilize prices closer to their true values. On the other hand, crowd behaviour and positive feedback loops in market participants may also increase volatility at times (Vskills, 2020).

Sum up, Commodities are much less widely traded than stocks, speculators add significantly more liquidity to the commodity markets, thereby helping to facilitate trading among all the market participants. Speculators also influence prices of commodities in a way that helps to protect against massive price fluctuation. Speculators, by vastly increasing the number of market participants, also importantly serve to prevent market manipulation. With so many traders holding a variety of trading positions, it is difficult for even the largest participants in the market to successfully manipulate prices or “corner the market” (take control of virtually all the supply of a commodity).

2. Speculation in the Commodity Market

Speculation in commodity futures is popular because like forex trading, commodity trading offers traders high amounts of leverage. In speculation the trader holds different trading positions using futures contract that reflect their expectation, and the process require the presence of the clearing house as regulator or intermediary; before enter into futures contract and hold a specific position in futures contract the clearing house require a margin and the future contract is marked to market (daily settlement).

2.1. Futures contracts and Positions

When developing a new contract, the exchange must specify in some detail the exact nature of the agreement between the two parties. In particular, it must specify the asset, the contract size (exactly how much of the asset will be delivered under one contract), when delivery will be made.

i. Asset

When the asset is a commodity, there may be quite a variation in the quality of what is available in the marketplace. When the asset is specified, it is therefore important that the exchange stipulate the grade or grades of the commodity that are acceptable. For some commodities a range of grades can be delivered, but the price received depends on the grade chosen. For example, in the CME Group's corn futures contract, the standard grade is "No. 2 Yellow," but substitutions are allowed with the price being adjusted in a way established by the exchange. No. 1 Yellow is deliverable for 1.5 cents per bushel more than No. 2 Yellow. No. 3 Yellow is deliverable for 1.15 cents per bushel less than No. 2 Yellow (Hull, 2012). The financial assets in futures contracts are generally well defined and unambiguous. For example, there is no need to specify the grade of a Japanese yen. However, there are some interesting features of the commodities futures contracts traded on the exchange which must be specified.

ii. Contract Size

The contract size specifies the amount of the asset that has to be delivered under one contract. This is an important decision for the exchange.

Example: The oil futures size is 1000 barrels, corn futures size is 5000 Bushels, wheat futures size 5000 bushel. So, if trader (speculator or hedger) wants to buy or sell for example 6000 barrels he has to buy 6 oil futures contracts to cover its future need.

iii. Delivery Months

A futures contract is referred to by its delivery month. The exchange must specify the precise period during the month when delivery can be made. For many futures contracts, the delivery period is the whole month. The delivery months vary from contract to contract and are chosen by the exchange to meet the needs of market participants. The exchange specifies when trading in a particular month's contract will begin. The exchange also specifies the last day on which trading can take place for a given contract (Hull, 2012).

Example, corn futures traded by the CME Group have delivery months of March (March corn futures), May (May corn futures), July (July corn futures), September, (September corn futures) and December (December corn futures).

iv. Price Quotes

The exchange defines how prices will be quoted. For example, in the US, crude oil futures prices are quoted in dollars and cents.

v. Price Limits and Position Limits

For most contracts, daily price movement limits are specified by the exchange. If in a day the price moves down from the previous day's close by an amount equal to the daily price limit, the contract is said to be limit down. If it moves up by the limit, it is said to be limit up. A limit move is a move in either direction equal to the daily price limit.

The purpose of daily price limits is to prevent large price movements from occurring because of speculative excesses. However, limits can become an artificial barrier to trading when the price of the underlying commodity is advancing or declining rapidly. Whether price limits are, on balance, good for futures markets is controversial (Hull, 2012).

Position limits are the maximum number of contracts that a speculator may hold. The purpose of these limits is to prevent speculators from exercising undue influence on the market (Hull, 2012).

vi. Convergence of futures price to spot price

As the delivery period for a futures contract is approached, the futures price converges to the spot price of the underlying asset. When the delivery period is reached, the futures price equals—or is very close to—the spot price.

vii. Positions

In the futures contract the investor could take long or short position.

- **Long position:** the buyer in the futures contract is known as to hold a long position or simply long.
- **Short position:** the seller in the futures contracts is said to be having short position or simply short.

2.2 Futures Margins

Futures are traded on margin, the margin is the amount of funds required to enter into a futures position—typically a fraction of the total value of the contract. In futures, trader put down a good faith deposit called the initial margin requirement. The cash for the initial margin requirement is automatically set aside in the trader’ account and subtracted from his buying power once an order is entered. Whether trader go long or short, initial margin requirements are the same but vary by futures product—typically being a small percentage (ranging anywhere from 2% to 12%) of the notional value of the contract⁶. There’s also a maintenance margin requirement, or the balance trader’ account must carry to stay in the position, and that’s normally 70% to 85% of the initial margin (TD Ameritrade, 2019).

Example, if oil futures contract has an initial margin requirement of \$4000 and a maintenance margin of \$3200, buyers or sellers of futures must have \$4000 in their account to enter the contract and need to keep at least \$3200 in their account to stay in the position.

If the trader account balance falls below the maintenance margin requirement, his account will be issued a margin call. When this happens, trader typically has two choices:

⁶ *Notional value* is the cash equivalent value to owning the asset, or the total value of the contract.

Bring the account balance back up to the initial margin requirement by depositing additional funds into his account, to keep his position in futures;

Leaving the balance as it is (don't deposit additional funds), trader attempt to liquidate the position. So going back to the oil futures example above, if the trader initial margin falls to \$3,100, trader would have to bring in an additional \$900 to get his balance back to the \$4000 initial margin requirement ($4000 - 3100 = 900$).

Margin call example : In April 5th 2023, Investor X buys two September canola futures contract of 20 tonnes for \$550 per tonne. Investor posts an initial margin of 5% with the broker, and the maintenance margin is 80%. So, the amount of the **initial margin is 5% of the total value of the futures contract, the total contract value is $2*(20*550) = 22000$ \$, then the initial margin is $0.05*22000 = 1100$ \$; the maintenance margin is 80% of the initial margin i.e. $0.8*1100 = 880$ \$.**

If, the next day April 6th, the price of that canola contract goes down by \$6 per tonne to \$544, has a potential, or unrealized loss of \$240 ($(2*20)*6$). Trader's margin account has been reduced by the \$240 this loss reduces the trader initial margin to 860\$ it is below the maintenance margin, so the trader will receive a margin call to bring its account back to the required margin level, the commodity broker contacts the trader to send at least \$240 to bring the margin account up to the \$1100 initial margin level. This is known as a margin call.

The trader is entitled to withdraw any balance in the margin account in excess of the initial margin. To ensure that the balance in the margin account never becomes negative a maintenance margin, which is somewhat lower than the initial margin, is set. If the balance in the margin account falls below the maintenance margin, the investor receives a margin call and is expected to top up the margin account to the initial margin level by the end of the next day. The extra funds deposited are known as a variation margin. If the investor does not provide the variation margin, the broker closes out the position.

2.3 Marking to market adjustment: end of day settlement

Marking to market is the process used to price futures contracts at the end of every trading day. Made to accounts with open futures positions, this cash adjustment reflects the day's profit or loss, and is based on the settlement price of the product. The settlement price is determined by the

exchange during the settlement period, which happens once daily and differs by product. Since mark-to-market adjustments affect the cash balance in a futures account, they also affect whether the account maintains the margin requirement needed to continue holding an open position (TD Ameritrade, 2019). The mark-to-market process of gain or loss will continue until the position is closed and no more positions are held at the close of trading. Once you close out the position, all of the mark-to-market cash adjustments, as well as any cash credit or debit you receive from closing your position, can be added together to calculate your overall profit or loss on the trade (excluding any transaction costs) (TD Ameritrade, 2019).

To illustrate how margins work, we consider an investor who contacts his or her broker to buy three October gold futures contracts. We suppose that the current futures price is \$1240 per ounce. Because the contract size is 100 ounces, the investor has contracted to buy a total of 300 ounces at this price. The broker will require the investor to deposit funds in a margin account. We suppose this is \$6000 per contract, or \$18000 in total. At the end of each trading day, the margin account is adjusted to reflect the investor's gain or loss. This practice is referred to as daily settlement or marking to market. If a trader buys a futures contract in this case every day its position is opened (buy) at previous day closing price and closed (sell) at today or current closing price; so, if buy high sell low in day (futures price goes down in the end of trading day) he incurs a loss, he makes a profit if the buy low and sell high (futures price goes up in the end of the trading day). Suppose, for example, that by the end of the first day the futures price has dropped by \$8 from \$1,240 to \$1,232. The investor has a loss of \$2400 ($300 * \8), because the 300 ounces of October gold, which the investor contracted to buy at \$1,240, can now be sold for only \$1,232. The balance in the margin account would therefore be reduced by \$2400 to \$15,600. Similarly, if the price of October gold rose to \$1,245 by the end of the first day, the balance in the margin account would be increased by \$1,500 to \$19,500. A trade is first settled at the close of the day on which it takes place. It is then settled at the close of trading on each subsequent day.

Note that daily settlement is not merely an arrangement between broker and client. When there is a decrease in the futures price so that the margin account of an investor with a long position is reduced by \$2400, the investor's broker has to pay the exchange \$2400 and the exchange passes the money on to the broker of an investor with a short position. Similarly, when there is an increase

in the futures price, brokers for parties with short positions pay money to the exchange and brokers for parties with long positions receive money from the exchange.

2.4 The Clearing House

A clearing house acts as an intermediary in futures transactions. It guarantees the performance of the parties to each transaction. The clearing house has a number of members, who must post funds with the clearing house. Brokers who are not members themselves must channel their business through a member. The main task of the clearing house is to keep track of all the transactions that take place during a day, so that it can calculate the net position of each of its members (Hull, 2012).

Just as an investor is required to maintain a margin account with a broker, the broker is required to maintain a margin account with a clearing house member and the clearing house member is required to maintain a margin account with the clearing house. In determining clearing margins, the exchange clearing house calculates the number of contracts outstanding on either a gross or a net basis. When the gross basis is used, the number of contracts equals the sum of the long and short positions. When the net basis is used, these are offset against each other. Suppose a clearing house member has two clients: one with a long position in 20 contracts, the other with a short position in 15 contracts. Gross margining would calculate the clearing margin on the basis of 35 contracts; net margining would calculate the clearing margin on the basis of 5 contracts. (Hull, 2012).

2.5 Example of speculation in Commodity market

Speculation is taking a position (short or long) in futures contracts with the hope that the price will increase (decrease), in other word price move in a favorable direction to the trade position. The following examples are illustration on how the speculation works, i.e. how the speculators make a potential profit or incurs a loss from the trading position in Futures contract.

Example 1 (long position): Assume a speculator expects wheat prices to rise over the next few months, based on his belief that the upcoming crop will be less than most people expect. Through a commodity broker, he buys 15000 bushels of October wheat futures at \$7.57per bushels. Assume the initial margin is 8% and the maintenance margin is 75%; and that the size of wheat futures

contract is 5000 bushel/contract. If the wheat futures contract closing price in each day following the contract are:

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Trade price	7.55	7.49	7.45	7.4	7.36	7.42	7.5	7.55	7.61	7.7	7.81	7.89	7.95	7.98	8.11

First- the trader will buy 3 futures contracts of 5000 bushels, $5000 * 3 = 15000$ bushels.

Second- the amount required by the broker to initiate futures position is the **initial margin** which is: $0.08(15000*7.57) = 9084$ \$. the amount of money a trader must have on deposit to continue holding the position is **-maintenance margin-** which is $0.75*9084 = 6813$ \$.

Third- the position the investor take is **long position**, because he buys a futures contract now, and sells them in the future, he will make a profit if the Wheat futures contract prices will increase and incurs a loss if the price of wheat futures contract will decrease.

Day	Trade price (\$)	Settlement price (\$)	Daily gain (\$)	Cumulative gain (\$)	Margin account balance (\$)	Margin call (\$)
1	7.57				9084	
1		7.55	- 300	- 300	8784	
2		7.49	- 900	- 1200	7884	
3		7.45	- 600	- 1800	7284	
4		7.4	- 750	- 2550	6534	2550
5		7.36	- 600	- 3150	8484	
6		7.42	900	- 2250	9384	
7		7.5	1200	-1050	10584	
8		7.55	750	-300	11334	
9		7.61	900	600	12234	
10		7.7	1350	1950	13584	
11		7.81	1650	3600	15234	
12		7.89	1200	4800	16434	
13		7.95	900	5700	17334	
14		7.98	450	6150	17784	
15	8.11		1950	8100	19734	

In this example, the speculator buys a Wheat futures contract means he is taking a long futures position. Since futures contracts are margin transactions, the speculator only needs to put up a fraction of the total value of the contract. The initial margin would be \$9084 for the 3 contracts, which have a value of \$113550 (\$7.57 per bushel multiplied by 15000 bushel), and to hold the position the trader must have 6813\$ in his account.

From the Day one to the Day 5, the trader incurs a successive loss, On Day 4, the balance in the margin account falls below the maintenance margin level. This drop triggers a margin call from the broker for an additional \$2550 to bring the account balance up to the initial margin level of \$9084. From the sixth Day the trader started making profit. On Day 15, the investor decides to close out the position by selling three contracts. The futures price on that day is \$8.11, and the investor has a cumulative gain of \$8100.

Note that, we can also calculate the cumulative gain in this way (the last Day closing price – the first day opening price) * size = $(8.11-7.57) * 15000 = \$8100$.

Or (the balance of the last day – the initial margin) – margin call = $(19734 – 9084) – 2550 = \8100 .

Example 2 (short position): Assume a speculator expects Soybean prices to fall over the next few months, based on his belief that the upcoming crop will be more than most people expect. Through a commodity broker, he sells 10000 bushels of November Soybean futures at \$14.80 per bushels. Assume the initial margin is 10% and the maintenance margin is 80%; and that the size of Soybean futures contract is 5000 bushel/contract. If the Soybean futures contract closing price in each day following the contract are:

Day	1	2	3	4	5	6	7	8	9	10	11	12	13
Trade price	14.75	14.68	14.62	14.69	14.74	14.81	14.95	15.1	15.05	14.97	14.84	14.75	14.6

First- the trader will sell two futures contracts of 5000 bushels $5000*2=10000$ bushels

Second- the amount required by the broker to initiate futures position is the **initial margin** which is: $0.1(10000*14.80) = \$14800$. the amount of money a trader must have on deposit to continue holding the position is **-maintenance margin-** which is $0.8*14800 = \$11840$.

Third- the position the investor take is **short position**, because he sells a futures contract now, and buys them in the future, he will make a profit if the Soybean futures contract prices will decrease and incurs a loss if the price of Soybean futures contract will increase.

Day	Trade price (\$)	Settlement price (\$)	Daily gain (\$)	Cumulative gain (\$)	Margin account balance (\$)	Margin call (\$)
1	14.80				14800	
1		14.75	500	500	15300	
2		14.68	700	1200	16000	
3		14.62	600	1800	16600	
4		14.69	- 700	1100	15900	
5		14.74	- 500	600	15400	
6		14.81	- 700	- 100	14700	
7		14.95	- 1400	-1500	13300	
8		15.1	- 1500	-3000	11800	3000
9		15.05	500	-2500	15300	
10		14.97	800	-1700	16100	
11		14.84	1300	-400	17400	
12		14.75	900	500	18300	
13		14.6	1500	2000	19800	

In this example, the speculator sells a Soybean futures contract means he is taking a short futures position. Since futures contracts are margin transactions, the speculator only needs to put up a fraction of the total value of the contract. The initial margin would be \$14800 for the 2 contracts, which have a value of \$148000 (\$14.8 per bushel multiplied by 10000 bushel), and to hold the position the trader must have \$ 11840 in his account.

From the Day one to the Day 3, the trader makes a successive profit. From the Day 4 till the Day 8 he incurs a successive loss; on the Day 8, the balance in the margin account falls below the maintenance margin level. This drop triggers a margin call from the broker for an additional \$3000 to bring the account balance up to the initial margin level of \$14800. From the Day 9 the trader started making profit. On Day 13, the investor decides to close out the position by buying two futures contracts. The futures price on that day is \$14.6, and the investor has a cumulative gain of \$2000.

Note that, we can also calculate the cumulative gain in this way

(the first Day opening price – the last day closing price) * size = (14.8-14.6) * 10000 = \$2000. Or,
 (the balance of the last day – the initial margin) – margin call = (19800 – 14800) – 3000 = \$2000

Practice Questions

Part one : Choose the right answer

1. Who can buy and sell a future contract in commodity exchange
 - a. Speculator
 - b. Hedger
 - c. Arbitrageur
 - d. All of the above
 - e. None of the above
2. The basic positions on futures contract are:
 - a. Long Positions
 - b. Short Positions
 - c. All of the above
3. Which of the following items in futures contract is standardized?
 - a. Total number of contracts available for buy / sell.
 - b. Price of the underlying financial security.
 - c. Size – the Lot size of the underlying item of the contract.
 - d. All of the Above.
4. What is mark to market?
 - a. Mark to market (M2M) or Marking to market is a procedure which tells your profit or loss on monthly basis as long you hold the futures contract.
 - b. Mark to market (M2M) or Marking to market is a procedure which adjusts your profit or loss on the basis of volume traded as long you hold the futures contract.
 - c. Mark to market (M2M) or Marking to market is a procedure which adjusts your profit or loss on day to day basis as long you hold the futures contract.
 - d. None of the Above.
5. If the a trader expect futures price to goes up than he take..... position in futures contract.
 - a. Short position
 - b. Long position

- c. None of the above
- d. Both (a) & (b)

Part two

1. Suppose that a trader enter into a short futures contract to sell September Gold for \$1215.5 per ounce. The size of the contract is 200 ounces. The initial margin is \$14586, and the maintenance margin is \$10939.5. What change in the futures price will lead to a margin call? What happens if the trader does not meet the margin call?
2. Suppose that trader enter into a long futures contract to buy June oil for \$90 per barrel. The size of the contract is 2,000 barrel. The initial margin is \$9,000, and the maintenance margin is \$7200. What change in the futures price will lead to a margin call? What happens if trader does not meet the margin call?
3. Suppose that in September 2022 a company takes a long position in a contract on May 2023 crude oil futures. It closes out its position in April 2023. The futures price (per barrel) is \$78.5 when it enters into the contract, \$80.50 when it closes out its position, and \$79.10 at the end of December 2012. One contract is for the delivery of 2,000 barrels. What is the company's total profit? When is it realized? Assume that the company has a December 31 year-end.
4. A trader buys three June futures contracts on orange juice. Each contract is for the delivery of 15,000 pounds. The current futures price is 150 cents per pound, the initial margin is 5%, and the maintenance margin is 80%. What price change would lead to a margin call? Under what circumstances could \$1,000 be withdrawn from the margin account?
5. A company enters into a short futures contract to sell 5,000 bushels of wheat for 450 cents per bushel. The initial margin is 8% and the maintenance margin is 75%. What price change would lead to a margin call? Under what circumstances could \$1,500 be withdrawn from the margin account?

Part three

- I. A trader expects oil prices to rise over the next few months, through a commodity broker, he buys four (4) December oil futures at \$80 per barrels. Assume the initial margin is 8% and the

maintenance margin is 75%; and that the size of oil futures contract is 1000 barrels/contract. If the Oil futures contract closing price in each day following the contract are:

Day	1	2	3	4	5	6	7	8	9	10	11	12	13
Trade price	80.2	80.3	80.5	80.9	81.1	80.8	80.2	79.7	79.3	78.7	79.5	80.4	80.9

Calculate the initial margin and maintenance margin? which position the trader should take? Show the mark-to-market for the trader position, and determine the gain and the loss at each day?

II. A trader expects Corn prices to fall over the next few months, through a commodity broker, he sells two (2) October Corn futures at \$6.85 per bushel. Assume the initial margin is 6% and the maintenance margin is 80%; and that the size of Corn futures contract is 5000 bushels/contract. If the Corn futures contract closing price in each day following the contract are:

Day	1	2	3	4	5	6	7	8	9	10	11	12	13
Trade price	6.88	6.9	6.91	6.90	6.87	6.85	6.81	6.79	6.75	6.7	6.68	6.7	6.69

Calculate the initial margin and maintenance margin? which position the trader should take? Show the marking to market for the trader position, and determine the gain and the loss at each day?

Answers

Exercise One answer:

Question n°	1	2	3	4	5
Answer	d	c	b, c	c	b

Exercise two answer:

1. There will be a margin call when \$3646.5 has been lost from the margin account this will occur when the price of gold increase by $3646.5/200 = \$18.2325$; the price of gold must

therefore rise to \$1233.73/ounce for there to be margin call. If the Margin Call is not meet the broker close out the trader position

2. There will be a margin call when \$1800 (9000 - 7200) has been lost from the margin account (this will occur when the price of oil decrease by $1800/2000 = \$0.9$; the price of oil must therefore fall to 89.1/barrel for there to be margin call. If the Margin Call is not meet the broker close out trader position
3. The total profit is $(80.5 - 78.5) * 2000 = \$4000$; of this $(80.5 - 79.10) * 2000 = \2800 , \$2800 is realized on day-by-day basis between September 2022 and December 2022, a further $(79.10 - 78.5) * 2000 = \1200 is realized on day-by-day basis between January 2023 and April 2023.
4. First calculate the initial margin: $(15000 * 150) * 3 = 6750000 * 0.05 = 337500$ cent = \$3375, the maintenance margin is $3375 * 0.8 = \$2700$. So, there will be a margin call when \$675 has been lost from the margin account. this will occur when the price of orange juice falls by more than $3375/45000 = \$0.015$ or 1.5 cent to less than 148.5cent. 1000 can be withdrawn from the margin account if there is a gain of \$1,000, this will happen if the Futures price rise by \$ 0.0222 or 2.22 cent means the price become 152.2 cent per pound.
5. First calculate the initial margin and maintenance margin:

The value of the futures contract is $5000 * 450 = 2250000$ cent = \$22500

Initial margin = $22500 * 0.05 = 337500$ cent = \$1125.

The maintenance margin is $1125 * 0.75 = \$843.75$.

So, there will be a margin call when \$282 has been lost from the margin account. \$1500 can be withdrawn from the margin account if there is a gain of \$1,500, this will happen if the Futures price fall by \$ 0.3 or 30 cent means the price become 480 cent per bushel.

Exercise three answer

I. **First-** the trader buys 4 oil futures contracts of 1000 barrels ($1000 * 4 = 4000$ barrels).

Second- Initial margin which is: $0.08(4000 * 80) = 25600\$$.

Maintenance margin- which is $0.8 * 25600 = 20480\$$.

Third- the position the investor take is **long position**, because he buys a futures contract now, and sells them in the future, he will make a profit if the oil futures prices will increase and incurs a loss if the price of oil futures contract will decrease.

Day	Trade price (\$)	Settlement price (\$)	Daily gain (\$)	Cumulative gain (\$)	Margin account balance (\$)	Margin call (\$)
1	80				25600	
1		80.2	800	800	26400	
2		80.3	400	1200	26800	
3		80.5	800	2000	27600	
4		80.9	1600	3600	29200	
5		81.1	800	4400	30000	
6		80.8	-1200	3200	28800	
7		80.2	-2400	800	26400	
8		79.7	-2000	-1200	24400	
9		79.3	-1600	-2800	22800	
10		78.7	-2400	-5200	20400	5200
11		79.5	3200	-2000	28800	
12		80.4	3600	1600	32400	
13	80.9		2000	3600	34400	

The speculator buys oil futures contract means he is taking a long futures position. The initial margin is \$25600 and to hold the position the trader must have \$20480 in his account.

From the Day one to the Day 5, the trader makes a successive profit, from the Day 6 to Day 10 the trader position incurs a loss and On Day 10, the balance in the margin account falls below the maintenance margin level. This drop triggers a margin call from the broker for an additional \$5200 to bring the account balance up to the initial margin level of \$25600. From the Day 11 the trader started making profit. On Day 13, the investor decides to close out the position by selling four contracts. The futures price on that day is \$80.9, and the investor has a cumulative gain of \$3600. **Note that**, we can also calculate the cumulative gain in this way (the last Day closing price – the first day opening price) * size = $(80.9-80) * 4000 = \$3600$. or the (final balance -initial balance) – margin call = $(34400 -25600)-5200=\$3600$.

II.First- the trader will sell two futures contracts of 5000 bushels ($2*5000=10000$ bushels).

Second- Initial margin which is: $0.06(10000*6.85) = \$4110$.

Maintenance margin- which is $0.8 \times 4110 = \$3288$.

Third- the position the investor take is **short position**, because he sells a futures contract now, and buys them in the future, he will make a profit if the Corn futures price will decrease and incurs a loss if the price of Corn futures will increase.

Day	Trade price (\$)	Settlement price (\$)	Daily gain (\$)	Cumulative gain (\$)	Margin account balance (\$)	Margin call (\$)
1	6.85				4110	
1		6.88	-300	-300	3810	
2		6.9	-200	-500	3610	
3		6.91	-100	-600	3510	
4		6.9	100	-500	3610	
5		6.87	300	-200	3910	
6		6.85	200	0	4110	
7		6.81	400	400	4510	
8		6.79	200	600	4710	
9		6.75	400	1000	5110	
10		6.7	500	1500	5610	
11		6.68	200	1700	5810	
12		6.7	-200	1500	5610	
13	6.69		100	1600	5710	

In this example, the speculator sells a Corn futures contract means he is taking a short futures position. The initial margin would be \$4410 and to hold the position the trader must have \$ 3288 in his account.

From the Day one to the Day 3, the trader makes a successive loss. From the Day 4 till the Day 13 he makes a successive profit. On Day 13, the investor decides to close out the position by buying two futures contracts. The futures price on that day is \$6.69, and the investor has a cumulative gain of \$1600.

Note that, we can also calculate the cumulative gain in this way

(the first Day opening price – the last day closing price) * size = $(6.85 - 6.69) \times 10000 = \1600 . Or,
 (the balance of the last day – the initial margin) – margin call = $(5710 - 4410) - 0 = \$1600$

**Chapter seven:
Short Selling in Futures
Markets**

The commodity market is an excellent vehicle for traders that use highly leveraged future contract to make profits from just a relatively small move in price. The interesting thing of futures markets is that the traders can make a profit when markets move higher (appreciate) and when the markets move lower (depreciate). In fact, short selling is just betting that a commodity will drop in price and take a short position, this position will make money as the price of the commodity declines ; to close a short position, the broker have to buy that same contract back.

1. Short Selling concept

1.1. Definition

Short selling is an investment or trading strategy that speculates on the decline in a stock or other security's price. Traders may use short selling as speculation, and investors or portfolio managers may use it as a hedge against the downside risk of a long position in the same security or a related one. Speculation carries the possibility of substantial risk and is an advanced trading strategy that should only be undertaken by experienced traders and investors (Hayes, 2023).

To 'short' (sell, or short selling) a commodity means betting against the price of a raw material, such as oil or gold. In other words, expect the market price will fall, If this occurs, trader will make a profit, but if the market price rises, trader will make a loss (IG, 2022).

Example, if trader expects that a political conflict will have a negative impact on the price of wheat, he can open a short position and profit from falling prices.

1.2. How is commodity shorted?

Like we mentioned before, trader don't have to own any physical materials to do the short selling. Commodity shorting can easily be done via derivatives such as CFD⁷s and spread bets, which enable trader to speculate on price movements. One of the benefits of CFD trading and spread betting is that trader can trade using leverage. This means trader only need a small deposit to open a position, while still getting exposure to the full value of the trade. However, the trader's profit and loss will be based on the full position size.

❖ How to short commodities

⁷ *CFD trading is the method of speculating on the underlying price of an asset – like shares, indices, commodities, cryptos, forex and more – on a trading platform like ours. A CFD – short for 'contract for difference' – is the type of derivative that enables you to trade the price movements of these financial markets with us.*

If trader want to short commodities, he can do so through CFD trading or spread betting. Both methods enable him to sell without owning any underlying assets. Follow these steps to short commodities (IG, 2022):

1. Creatin trading account log in to the existing account
2. Open the appropriate platform and search for the commodity desired to be shorted.
3. Choose the position size
4. Select 'sell' in the deal ticket and confirm the trade

1.3. Reasons to short a commodity

The biggest reason why you may want to short a commodity is to take advantage of a market that is declining in value. This means more trading opportunities in volatile market conditions. However, there are other advantages to shorting, such as hedging. You can use short-selling to hedge open positions and protect against losses on a long position. (IG, 2022)

For example, if investor owned gold and was worried about it falling in value, he could use a short position to offset the risk. This short position would turn to profit if your physical holdings fell in value, and make a loss if the price of gold increased. Hedging a position may not necessarily prevent a loss entirely, but it can mitigate the impact.

1.4. Example of shorting Commodity

First-Gold shorting example with CFDs⁸

Assume a gold is trading at 1980 with a sell price of 1979.85 and a buy price of 1980.20. Because trader expect the price of gold is going down, he want to short selling using a CFD. So, he short 1£ ten (10) contracts of Gold at the sell price of 1979.85.

In this case, the contract size is £1 per point and with 10 contract his position value is £19798.5 (10 x £1 x 1979.85). The margin for commodities is 5%, so He has to put down £1187.91 to open the position. The gold price falls to 1965.75 and trader decides to close his trade and take his profit. To do this, he reverses the trade (take the opposite position) by buying ten contracts at the new buy price of 1965.75. These contracts are valued at £19657.5, which means he makes a profit of £141 (£19798.5 - £19657.5).

⁸ A contract for difference (CFD) on gold is a derivative product that allows trader or investor to trade the underlying asset, i.e. the price of gold, without having actual ownership of the asset. The nice thing about CFDs is that trader can still enjoy the gains as if he owned the gold. Additionally, CFDs are traded on margin, giving him greater exposure to the gold market for only a fraction of the amount he would need to buy physical gold.

If the trader prediction was wrong and the gold price goes up, he close the trading position and incurs a loss.

Second- Oil shorting example using CFD

- Assume that Brent crude oil is trading at 7468 with a sell price of 7459 and a buy price of 7464. Suppose a trader “X” expect that the price of oil is going to fall, so he decides to short the market using a spread bet (CFD). He short 5\$ one contracts of Oil at the sell price 7459 (because the size of CFD is 100 barrels, so the selling price is $74.59 \times 100 = 7459$ points). The trader total exposure would be \$37295 ($7459 \times \5 per point) and, because trader is trading using leverage, the require margin would be \$2237.7 (6% of the value of the trade).

The oil price falls to 7430 and the trader decides to close his position; because the oil price fell by 29 points, trader profit will be \$145 ($29 \times \5). If the oil price goes up the trader will incur a loss.

- Assume another example, if trader think US crude (WTI) is going to fall, you might open a short position by selling 100 barrels of US crude CFDs at \$66 per barrel. The value of the opening trade is \$6,600 and as the margin requirement is 5% therefore the amount required to be paid by the buyer upfront is \$330. The price subsequently falls to \$61 and the position is closed by buying back 100 barrels at \$61, therefore generating a return of \$5 per barrel, or a total profit of \$500.
- A trader expects that the price of cocoa is going to fall because of good weather in West Africa, the spread betting company might quote a price of 2,950–2,955 per tonne in the daily futures market. The trader decides to bet \$10 a point at \$2,950 in the expectation that prices will go down. The price quickly falls to \$2800–\$2805 per tonne and buy at \$2805 per tonne, netting \$1450 ($145 \text{ points} \times \10).

1.5. Risks when shorting commodities

From the examples above, we conclude that one of the main risks when shorting commodities is that the commodity price can theoretically increase indefinitely. If this happens, all the short sellers try to offset their positions at the same time. This causes a “short squeeze⁹”, which pushes the price up and amplifies losses. To limit this risk, the traders have to make sure that they have a good

⁹ *A short squeeze often feeds on itself, sending the asset’s trading price even higher and forcing more short sellers to cover their positions. As traders who previously sold short the asset must buy to cover their positions, the closing out of their short trades simply adds more buying pressure to the market, thus further fueling a rise in the asset’s price* (CFI Team, 2023).

trading plan and appropriate risk management steps in place ; or choose to se tools like guaranteed stops to limit their losses, if the market price goes up (IG, 2022).

2. Advantages and disadvantages of short selling

The short selling has advantage and disadvantage that we can summarize as follow (Fabozzi, 2006):

2.1. Advantages

- Provides liquidity to the market, which may reduce stock prices, improve bid-ask spreads and assist in price discovery.
- Ability to hedge an existing portfolio's long-only exposure and reduce the overall market exposure.
- Short Selling helps the manager use capital proceeds to overweight the portfolio's long-only component.
- Exposure to both short and long positions can minimize a portfolio's overall volatility and the ability to add meaningful risk-adjusted returns.

2.1. Disadvantages

1. Shorting stocks is considered highly volatile, while t's possible for a stock to fluctuate and go to zero, but this will be seen in a rare case. Stock prices tend to revert, and this turnaround can be quick and significant on the back of some events.
2. Less liquid stocks can be expensive to buy, and the exchange may limit or short Selling during volatile market conditions.
3. Short sellers run the risk of borrowed stock recalled by their broker when the short seller has limited control over the price of covering their position.
4. While the maximum potential for shorting a stock is 1x, a stock price should be appreciated as there is no limit to the potential losses.
5. Short squeezes, where rapid and high upward price fluctuates cause short sellers to cover in mass, can push prices against short-sellers more and more.

3. Risk of Short Selling

Apart from the risk of losing money from shorty selling, let's look at some of the major risks of short selling (nirmalbang, 2019):

- **Making a mistake in timing**

The exercise of conducting short-selling depends on the proper timing of buying and selling the underlying asset. However, the stock prices may not immediately fall, and while a trader is waiting to book a profit from stock price, he is liable to pay interest and margin.

- **Borrowing money**

Short selling is known as margin trading, in which a trader borrows money from a brokerage by using an asset called collateral. The brokerage firm made it compulsory for all traders to maintain a certain percentage in the account. If a trader falls short at any point, they will be asked to meet the shortfall.

- **Selecting wisely**

Several companies go through ups and downs but overcome them deftly. Wise administration can transform the course of a company by increasing its share price instead of decreasing its value. However, If a trader chooses the wrong company to bet on, they may lose profit in short selling when others gain by taking a long position.

- **Regulations**

Although market regulators permitted short selling, they can face a ban in a specific sector at any time to safeguard and to avoid panic, which can lead to a rise in prices.

- **Betting against the trend**

The stock prices generally fluctuate up and down in the long run. Short selling depends on prices moving down, which is going against the drift.

Practice Questions: Choose the right answer

- 1. Which of the following is NOT a reason that an investor might short a stock?**
 - a. To hedge against a potential decrease in the price of an asset owned by the investor
 - b. To pairs trade
 - c. To gain revenue from an increase in stock price
 - d. To profit from a lower stock price
- 2. Which of the following terms refers to selling securities that the seller does not own to make a profit by repurchasing the security after the price falls and then returning it to the financial lender?**
 - a. Limit stop orders
 - b. Short selling
 - c. All or none order
 - d. Put options
- 3. Short-selling can be thought of as the opposite of going long or buying shares**
 - a. True
 - b. False
- 4. A short-sell is when an investor predicts that the price of an asset will go...**
 - a. Up?
 - b. Down?
- 5. When a short-seller trades with a lender they will require the short-seller to deposit a margin**
 - a. True
 - b. False
- 6. A fund manager short sells shares of Google at \$300. He then closes out this position by placing a buy to cover trade at \$250. Does he make a profit or loss on this trade?**
 - a. Profit
 - b. Loss
 - c. Breaks even

7. When a fund manager short-sells a stock he must return the same amount of shares to the lender when closing the position regardless of the share price?

- a. True
- b. False

8. Why would a fund manager short-sell?

- a. Speculation
- b. Hedging
- c. Both

Answers

<i>Question n°</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
<i>Answer</i>	<i>c</i>	<i>b</i>	<i>a</i>	<i>b</i>	<i>a</i>	<i>a</i>	<i>a</i>	<i>c</i>

**Chapter eight:
Clearing and settlement**

Clearing and settlement are two distinct but interrelated processes in financial transactions. Clearing is the process of reconciling and confirming financial transactions between the parties involved. This involves verifying the accuracy of the transaction details and ensuring that each party has sufficient funds to complete the transaction. Once all parties agree on the details of the transaction, it is considered "cleared" and ready for settlement. Settlement, on the other hand, is the process of the actual transfer of funds or securities between the parties involved in the transaction. This involves transferring money between bank accounts or transferring securities from one account to another. In general, clearing and settlement are carried out by a central entity such as a clearing house or a settlement bank. This entity acts as a trusted third party, ensuring that transactions are processed quickly and efficiently, and transaction risks are minimized.

1. Clearing and Settlement Definition

Clearing and settlement are critical processes to ensure the proper functioning of financial markets and avoid counterparty risks. They also reduce transaction costs and facilitate liquidity in financial markets. The settlement of derivatives is guaranteed by the clearing house associated with the exchange ; the clearing house acts as the central counterparty (CCP) to both sides of a transaction. It 'sits in the middle' of a trade once it is made, and becomes the buyer to the seller and the seller to the buyer. To manage its risks, the clearing house collects collateral known as **initial margin** when a position is opened. Furthermore, positions are regularly **marked-to-market** to ensure that trading losses do not accumulate over time. Traders who are losing money are subject to **margin calls** which means that they have to deposit additional collateral to maintain their positions. Clearing is important for completing the process of buying and selling by different parties. The commodities a trader buy and sell on any trading day are settled through a clearing corporation. Assume a trader is buying a new vehicle by issuing a cheque. The vehicle will be delivered (settlement) to a trader after the amount is received from the bank (clearing). Likewise, trading in commodity derivatives or any financial instrument involves clearing and settlement. Let us understand this concept in detail.

1.1. Clearing: clearing refers to the process of accounting to update and reconcile obligations / payments of parties involved in the trade (Goldenberg, 2016).

Example: Assume a trader buys gold at \$63 per gram during a particular trading session and the market closed on that day at \$63.5 per gram. In this case, the market closing is higher than the market opening price (purchase price). Hence, trader's ledger shows a profit of \$0.5 per gram and if the market closes below the purchase price, the trader ledger shows a loss. At the exchange level, somebody's loss is somebody's profit. This process happens every day after closing of the market and it also helps in marking to market the open position.

1.2. Settlement involves matching outstanding buy and sell instructions by transferring ownership of commodities against funds between buyer and seller (Goldenberg, 2016). There are two types of settlements spot settlement, and forward settlement. Spot settlement also known as rolling settlement is one in which the trade is settled in the 2 days following the trade. Trades are T+2 days settlement indicates that deals are closed after the second working day. Sunday, Saturday, are banks holidays, and exchange holidays are not included in this time frame. So, if a trade is made on a Tuesday, it will be closed on a Thursday. Similarly, if trader buys a stock on Friday, he must pay the broker that day, but the stocks will be deposited in trader's account the following Tuesday. And the trader become the shareholder of record on the day that his trades are settled.

Example: trader buys a copper at \$3.8/Pound and intend to take delivery of the material through the exchange platform. In this case, the exchange finds a seller against buyer position and arranges for transfer of goods between the seller and buyer against funds between buyer and seller.

2. Process of clearing and settlement

2.1. Tips of clearing process: in the following the clearing tips (Chisholm, 2010)

1. Commodity exchanges transmit trade details to clearing house on a real time basis ;
2. Once the trade details are received, the clearing house informs trading members about obligations;
3. Clearing members receive notifications regarding commitment notice of payment of funds and other obligations;
4. Clearing banks are directed to make funds available by paying on time;

5. Funds are paid (Pay-in of funds) for transactions executed by the clearing banks this by debiting the account of the clearing members and depositing the amount due to them in the account of the clearing company.
6. Funds are paid (Pay-out of funds) based on the instructions of the clearing company through the clearing banks and are credited to the account of the clearing members, as appropriate.

Let us understand this through an example. John and Naomi are two clients rely on clearing corporation of an exchange.

Clearing Corporation	A	B
Name of client	John	Naomi
Trade	Buys 500 gram of gold at \$63/gram	Sells 500 gram of gold at \$63/gram
Margin required at 8%	$63 \times 500 \times 8\% = \2520	$63 \times 500 \times 8\% = \2520
Market closes at \$ 63.6/gram		
Profit / Loss	John gains 300\$	Naomi loses \$300
Clearing process	Pay-out of \$ 300 to John	Pay-in of \$ 300 from Naomi

Thus, on every trading day, till the expiry of the Futures Contract, there is some amount of Mark-to-Market gain equal to Market to market loss, across members, which needs to be settled. The following figure summarize the clearing and settlement process.

Figure 10: Commodity clearing and settlement process



Source : (ICICI direct iLearn, 2022) <https://www.icicidirect.com/ilearn/currency-commodity/courses/chapter-5-clearing-and-settlement-in-commodity-derivatives>

2.2.Entities involved in the clearing and settlement process

The commodity clearing and settlement process involves various intermediaries namely clearing corporations, clearing members, clearing banks, warehouse services providers, custodial services and e-registry service providers.

2.3.Delivery process

The commodity market is distinct from the equity market because of delivery of commodities between buyers and sellers. Upon expiry of contracts, commodities are exchanged physically between buyers and sellers thereby. After the clearinghouse interposes itself between the original buyer and seller, each of the trading partners has no obligation to any other trader. As delivery approaches, the clearinghouse supervises the arrangements for delivery. First, the clearinghouse will pair buyers and sellers for the delivery and will identify the two parties to each other. Second, the buyer and seller will communicate the relevant information concerning the delivery process to the opposite trading partner and to the clearinghouse. Usually, the seller can choose exactly what features the delivered assets will have. Once the funds have been transmitted to the seller's account and this transaction has been confirmed by the seller's bank, the seller will deliver title to the assets to the buyer. As long as this transaction is proceeding smoothly, which is usually the case, the clearinghouse has little to do. It acts merely as an overseer. If difficulties arise, or if disputes develop, the clearinghouse must intervene to enforce the delivery rules specified in the contract. (KOLB & Overdahl , 2006). The table below show the delivery date by commodity.

Table 6: delivery date (expiration date) by commodity

Commodity	Expiry date
Gold Mini	5 th of the expiry month
Gold Guinea	Last trading day of the expiry month
Silver	5 th of the expiry month
Silver Mini	Last trading day of the expiry month
Crude Oil	19 th of expiry month
Natural Gas	26 th of expiry month
Aluminium	Last trading day of the expiry month
Copper	Last trading day of the expiry month
Lead	Last trading day of the expiry month
Nickel	Last trading day of the expiry month
Zinc	Last trading day of the expiry month

Source: (ICICI direct iLearn, 2022) <https://www.icicidirect.com/ilearn/currency-commodity/courses/chapter-5-clearing-and-settlement-in-commodity-derivatives>

The types of delivery: there is three types of deliveries in commodity market namely, compulsory delivery, sellers' option and intention matching (ICICI direct iLearn, 2022).

- i. Compulsory delivery:** in this type, all open positions, need to be settled physically on the expiry date of the contracts.
- ii. Sellers' option:** in this type, the sellers will have an edge while selecting delivery location and quantity.
- iii. Intention matching :** in this types the physical delivery happens only when both buyer and seller agree to exchange the physical commodity.

2.4. Premium/Discount

Since commodities traded on some exchanges are deliverable, the quality of these commodities is very important. While designing the contract, the exchanges define acceptable quality standards that must be maintained. The quality specifications of alloys and metals remain the same at all times. However, the quality of agricultural products varies due to multiple factors. In such cases, the exchange notifies a premium and a discount for the quality of agricultural commodities. If the quality of the product is better than the contract specifications, the seller will receive a premium, and if the quality is less than the contract specifications but within acceptable limits, it is settled at a discount. Below are examples of annuity and discount calculations (ICICI direct iLearn, 2022) :

i. Premium

Castor seeds futures are available for trading on exchange. Its quality is largely dependent on oil content and it range from 37.2% - 60.6%, with an average of 48.2% (Wang , et al., 2010). If trader deliver castor seeds with 50.6 % oil content, the trader could get 2% additional price.

The price of castor seed with 48.6% oil content: \$90 per quintal

The premium calculation is $\$90 \times 0.02 = \1.8

Price of castor seed with 50.6 % oil content = $90 + (\$90 \times 2\%) = \$91.8/\text{quintal}$

ii. Discount

The ideal moisture content for cotton, is between 6.5% and 8%. When at this %MC, yarn processed from the cotton will be of a higher quality than it would be if the cotton was significantly lower in moisture content. Cotton that is much wetter than 8% MC is prone to sticking in machinery,

causing jams that hamper production or even ruin expensive equipment (McAlister , 2021). Generally speaking, the cotton with moisture content of 8.5% is the most preferred quality and the exchange accepts cotton with moisture up to 9.5% (from 8.5% to 9.5%) with discount (1%), and the one with moisture more from 10% - 11% is rejected. The calculation of discount is as follow: Cotton price is \$510/bale;

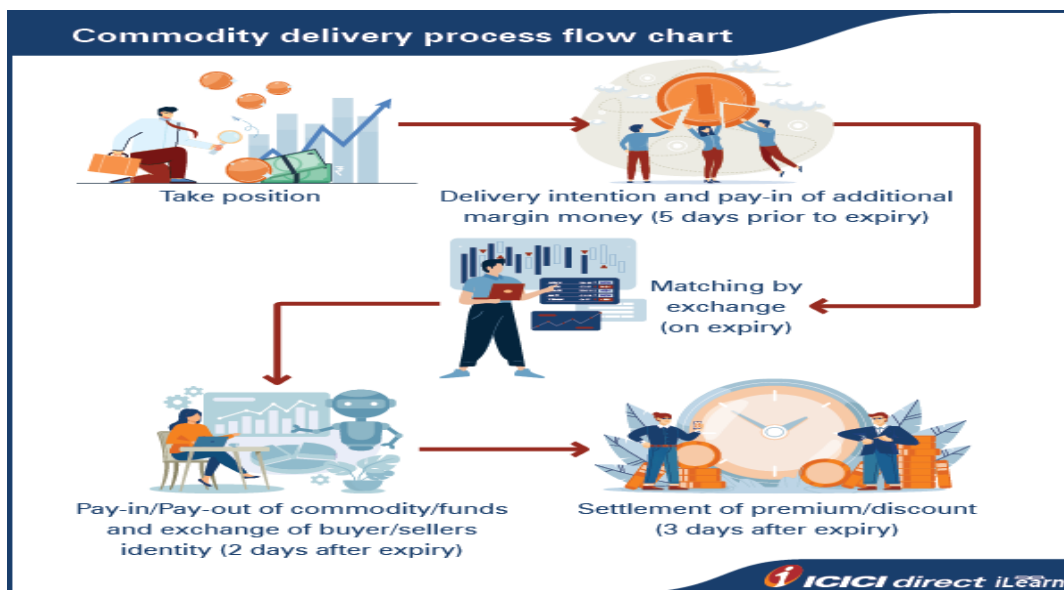
The discount is $510 \times 1\% = \$5.1/\text{bale}$

So, the Cotton price become $510 - (\$510 \times 1\%) = \$ 504.9/\text{bale}$.

2.5. Penalty for delivery default

Exchanges have a mechanism of tender delivery period, before the starting of this tender delivery period, trader is allowed to exit from an open position to avoid entering into delivery process. The commodities traded at some exchanges end with delivery contracts in some cases. The following graph show the commodity delivery process.

Figure 11: Contract expiry details



Source : (ICICI direct iLearn, 2022) <https://www.icicidirect.com/ilearn/currency-commodity/courses/chapter-5-clearing-and-settlement-in-commodity-derivatives>

In order to avoid delivery defaults, the exchange has laid down guidelines about defaults (ICICI direct iLearn, 2022). In commodity markets, a delivery default occurs when the seller of a commodity fails to deliver the agreed-upon quantity and quality of the commodity to the buyer at the specified delivery location and time. This can happen for various reasons, such as logistical issues, financial difficulties, or even intentional fraud. Or when the buyer is unable to settle the

commodity price. Delivery defaults can have serious consequences for both parties involved in the transaction and for the broader market. For the buyer, a delivery default means that they will not receive the commodity they need to fulfill their own obligations or to use in their business operations. For the seller, a delivery default can lead to reputational damage, financial penalties, and even legal action.

- i. Delivery default by seller:** If the seller defaults after showing delivery intention, in the case of the agricultural commodities then the seller has to pay 4% of the settlement price plus replacement cost, and he has to pay 3% of the settlement price plus replacement cost in case of non agricultural commodities to an exchange (Sebi, 2021).
- ii. Delivery default by buyer:** If the buyer defaults after showing delivery intention, the clearing corporation shall review the loss incurred by the non-defaulting party i.e., the seller at its sole discretion. The penalty collected from defaulting parties are used as follows (Sebi, 2021):
 - At least 1.75% is deposited in the Settlement Guarantee Fund of the clearing corporation.
 - Up to 0.25% is retained by the clearing corporation towards administrative expenses.
 - The affected party receives 1% in case of non-agri goods and 2% in case of agri goods plus replacement cost.
- iii.** An additional type of default in delivery is when the trader (seller or buyer) receives the margin call and he doesn't fulfill the request.

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